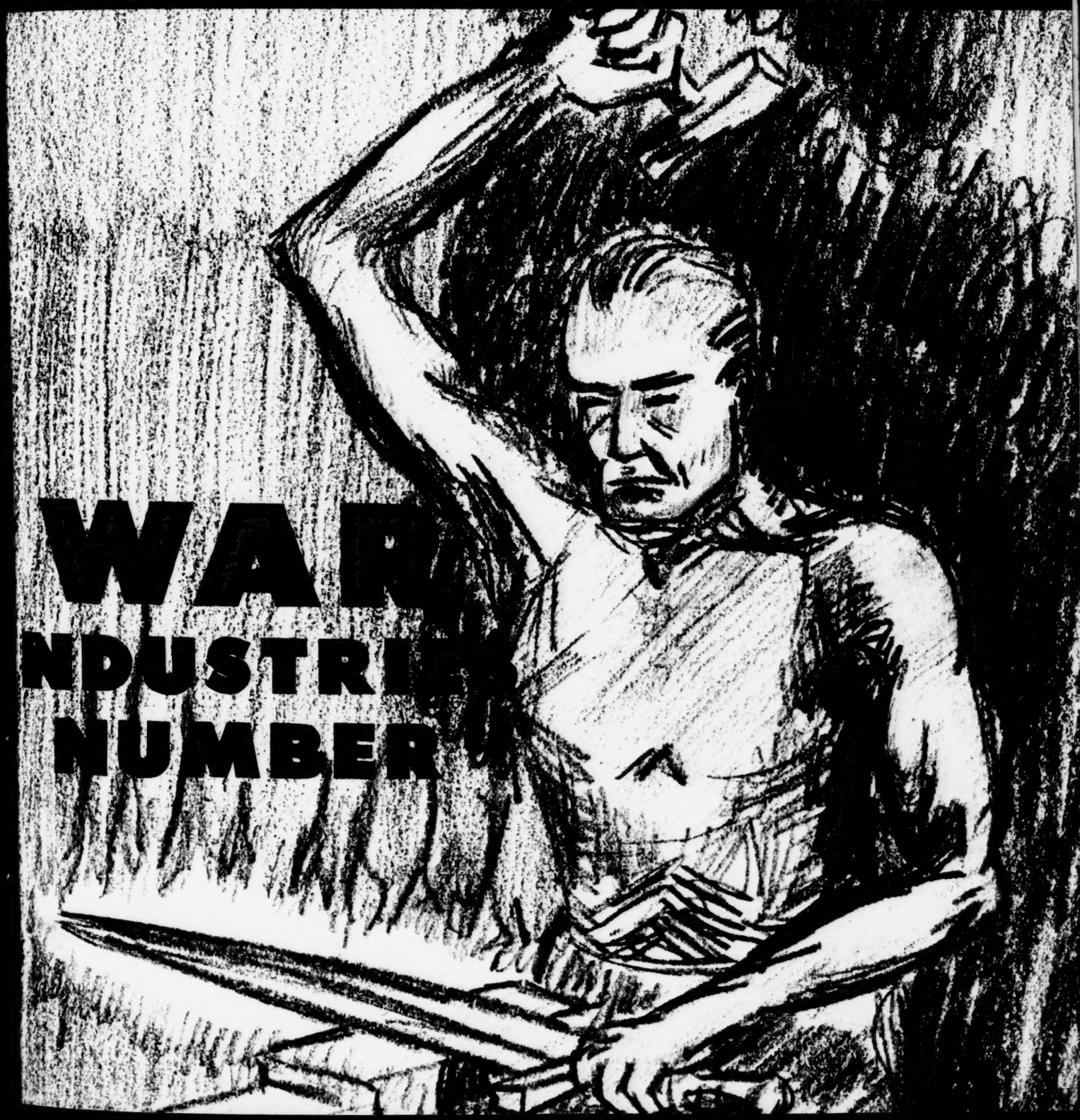
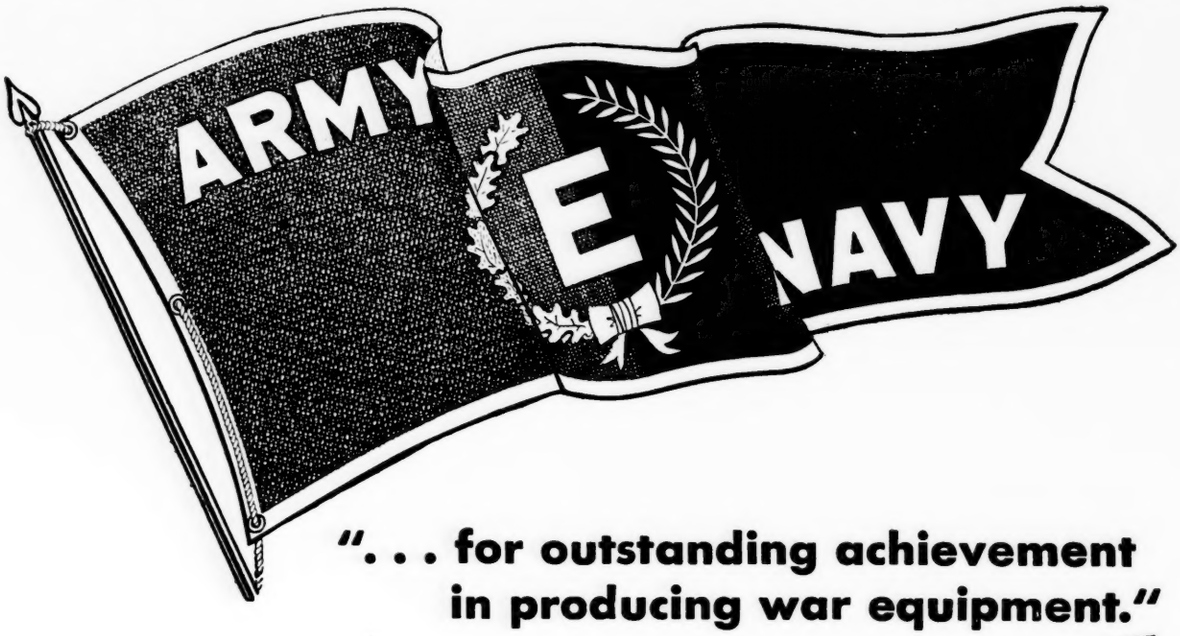
HEATING AND VENTILATING

THE AIR CONDITIONING MONTHLY

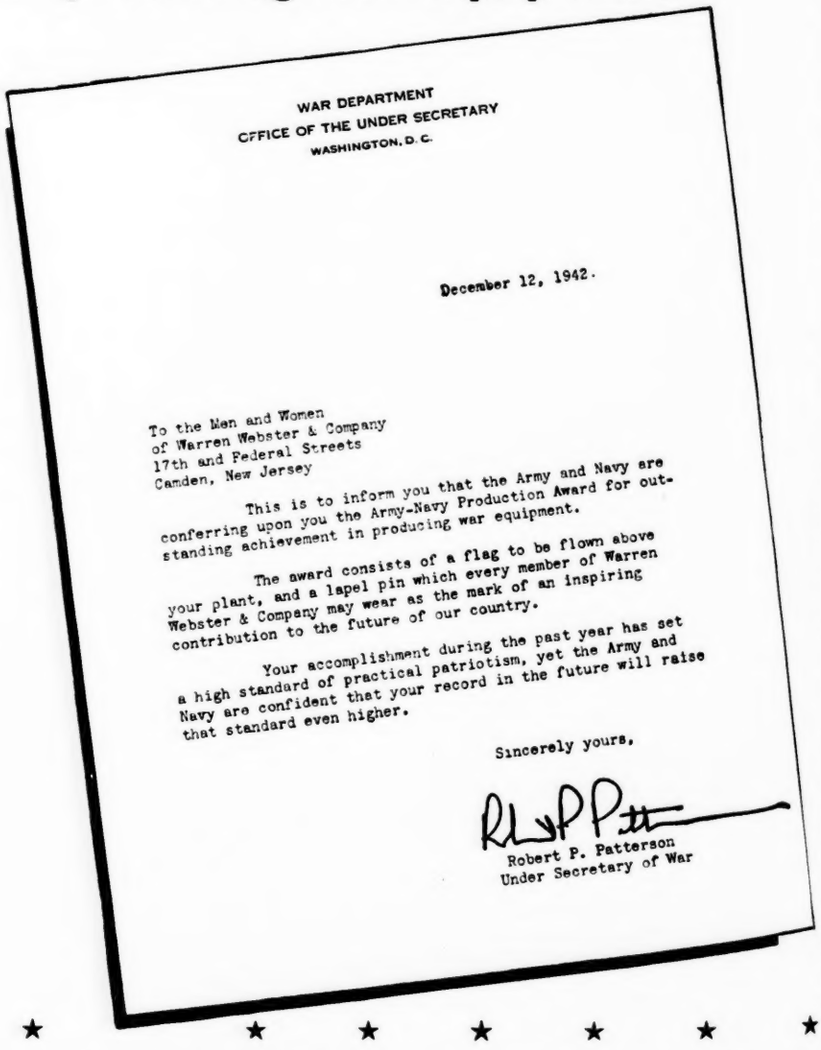


HONORING THE MEN AND WOMEN OF WARREN WEBSTER & COMPANY



". . . for outstanding achievement in producing war equipment."

This badge of honor will be worn proudly by every employee of Warren Webster & Company. It is a daily reminder that their production at high rate and quality is urgently needed for Victory . . . production of Ordnance materials for our fighting men . . . production of Webster Steam Heating Equipment for Army and Navy buildings, war plants, ships and other essential uses.



WAR DEPARTMENT
OFFICE OF THE UNDER SECRETARY
WASHINGTON, D. C.

December 12, 1942.

To the Men and Women
of Warren Webster & Company
17th and Federal Streets
Camden, New Jersey

This is to inform you that the Army and Navy are conferring upon you the Army-Navy Production Award for outstanding achievement in producing war equipment.

The award consists of a flag to be flown above your plant, and a lapel pin which every member of Warren Webster & Company may wear as the mark of an inspiring contribution to the future of our country.

Your accomplishment during the past year has set a high standard of practical patriotism, yet the Army and Navy are confident that your record in the future will raise that standard even higher.

Sincerely yours,

Robert P. Patterson
Under Secretary of War

-since 1888
Webster
Systems of
Steam Heating

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WARREN WEBSTER & COMPANY, CAMDEN, N. J.

Pioneers of the Vacuum System of Steam Heating, Representatives in principal U. S. Cities

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for . . .

engineers and contractors controlling the design, specification, installation and maintenance of heating, ventilating and air conditioning.

HEATING AND VENTILATING

The Air Conditioning Monthly

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CONTENTS FOR JANUARY, 1943

VOLUME 40 NUMBER 1

War Industries Number, begins on	29
Consolidated Aircraft Corporation	30
Wright Aeronautical Corporation	36
Behr-Manning Corporation	41
Kansas Bomber Plant	46
Allied Plastics Company	51
Navy Materials Testing Laboratory	54
Romanoff Caviar Company	62
American Propeller Corporation	64
Save — Simplify — Substitute!	67
* * * *	
Washington News	71
Picture Paragraphs	74
Degree Days for November, 1942	76
Reviews of Technical Publications	80
News of the Month	82
Reference Data 237 and 238	84
New Equipment	86
What Readers Say	88
Personals and Personnel	88
With the Manufacturers	89
New Catalogs	90
Coming Events	91
H & V's Photos	91
Industrial Degree Days for November, 1942	91

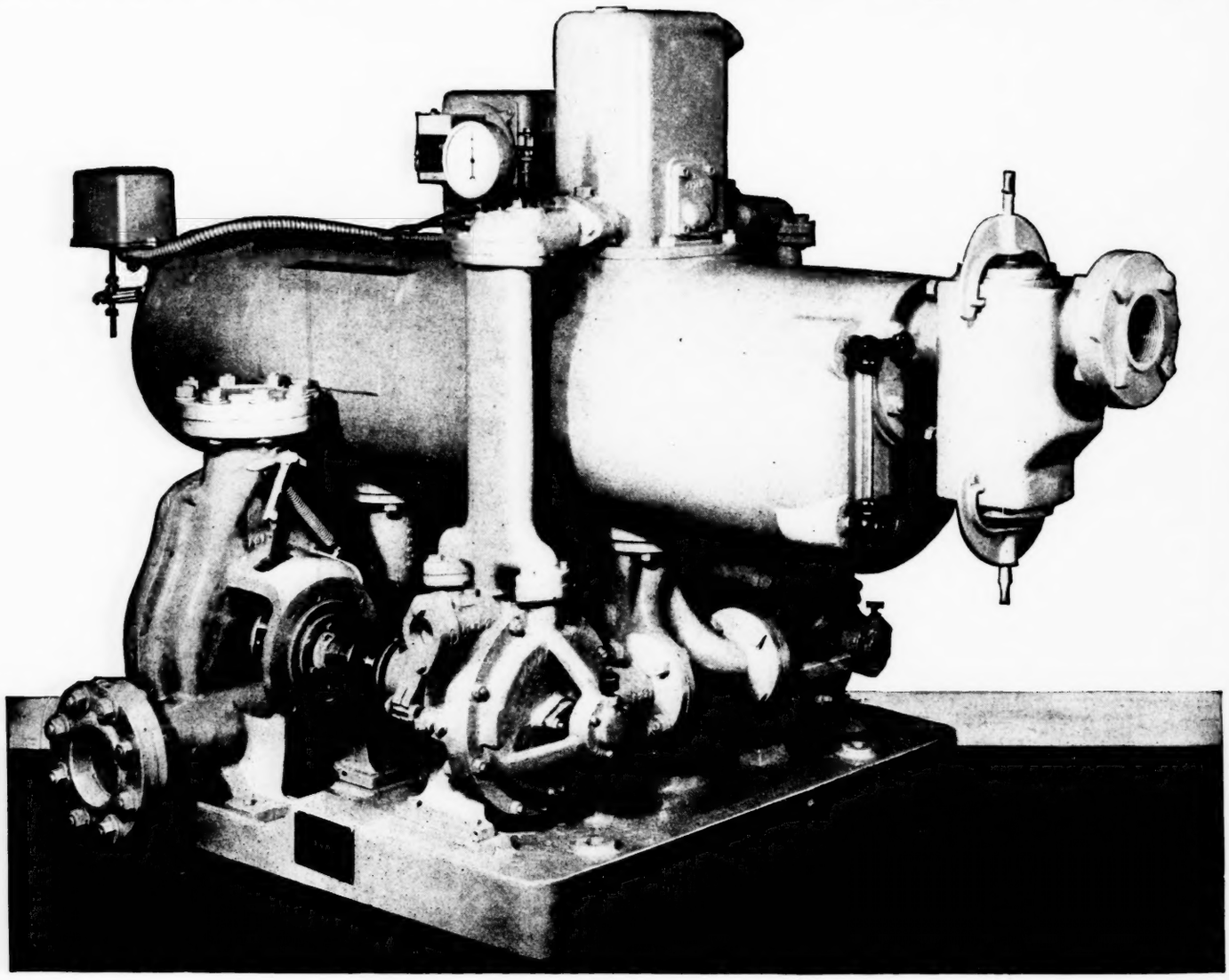
THIS MONTH'S COVER

From an original pencil drawing by Walter E. Robinson, Advertising Manager, The Industrial Press.

MEMBER

Audit Bureau of Circulation
Associated Business Papers

Where Heat Must Not Fail– Install this SAFE Heating Pump!



In Hospitals, Greenhouses, Schools, Public Buildings, Theatres, wherever heating systems must not fail, install the Nash Vapor Turbine, for it is entirely independent of electric current failure, and continues to operate as long as there is steam in the system.

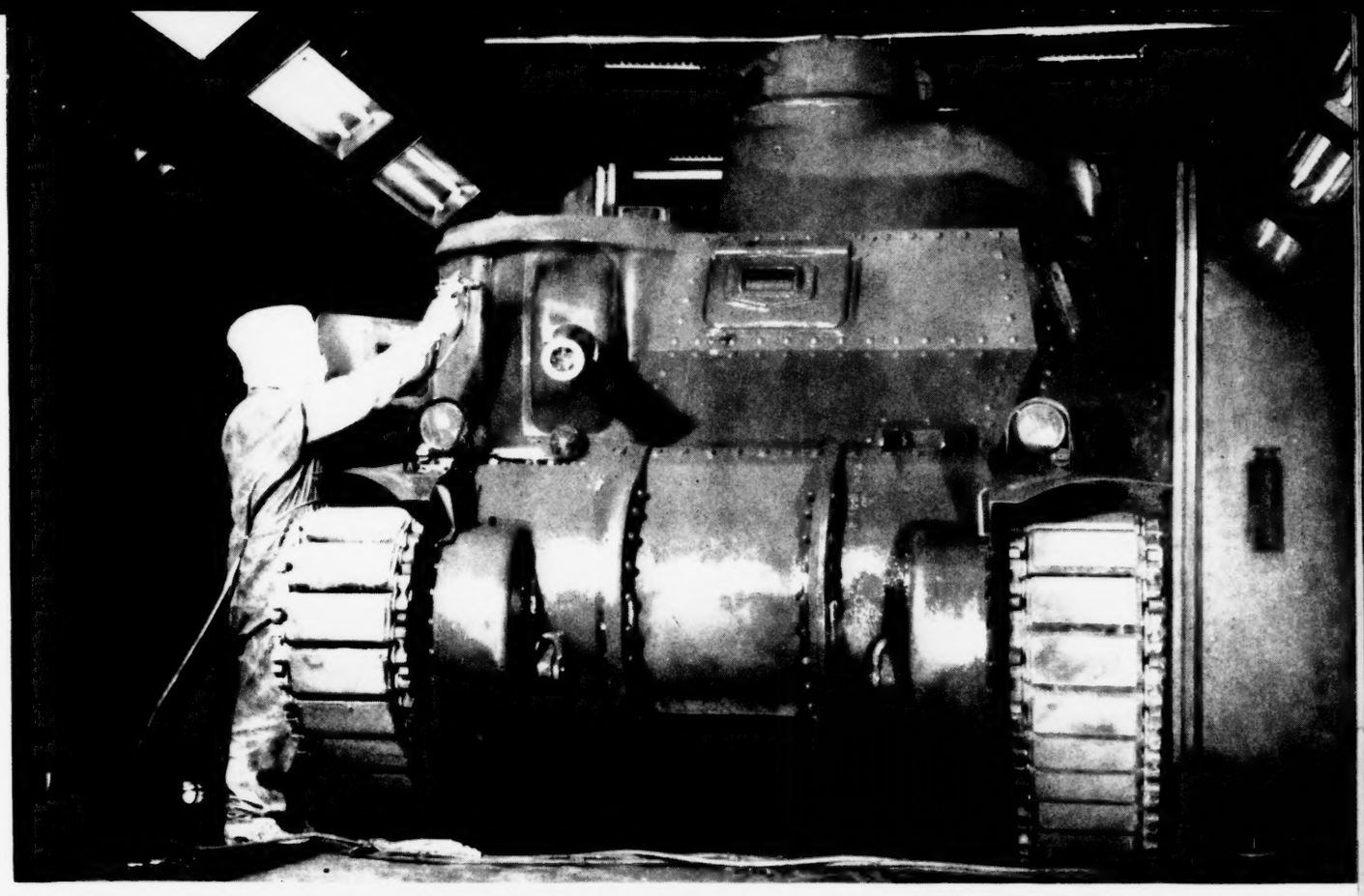
More than that, the Vapor Turbine is a most economical pump, for the elimination of electric current does away with current cost, the largest single item in the operation of an ordinary return line heating pump.

Greater savings still are effected by the Vapor Turbine in the system, for the reason that this pump operates continuously. It is the only pump that can do this with economy. Continuous operation means uniform circulation, and uniform circulation saves steam.

The Nash Vapor Turbine has but one moving part, rotating in the casing without metallic contact, and requiring no internal lubrication. Quiet, compact, and trouble-proof. Bulletin A-290 is free on request.

THE NASH ENGINEERING COMPANY

SOUTH NORWALK, CONNECTICUT, U. S. A.

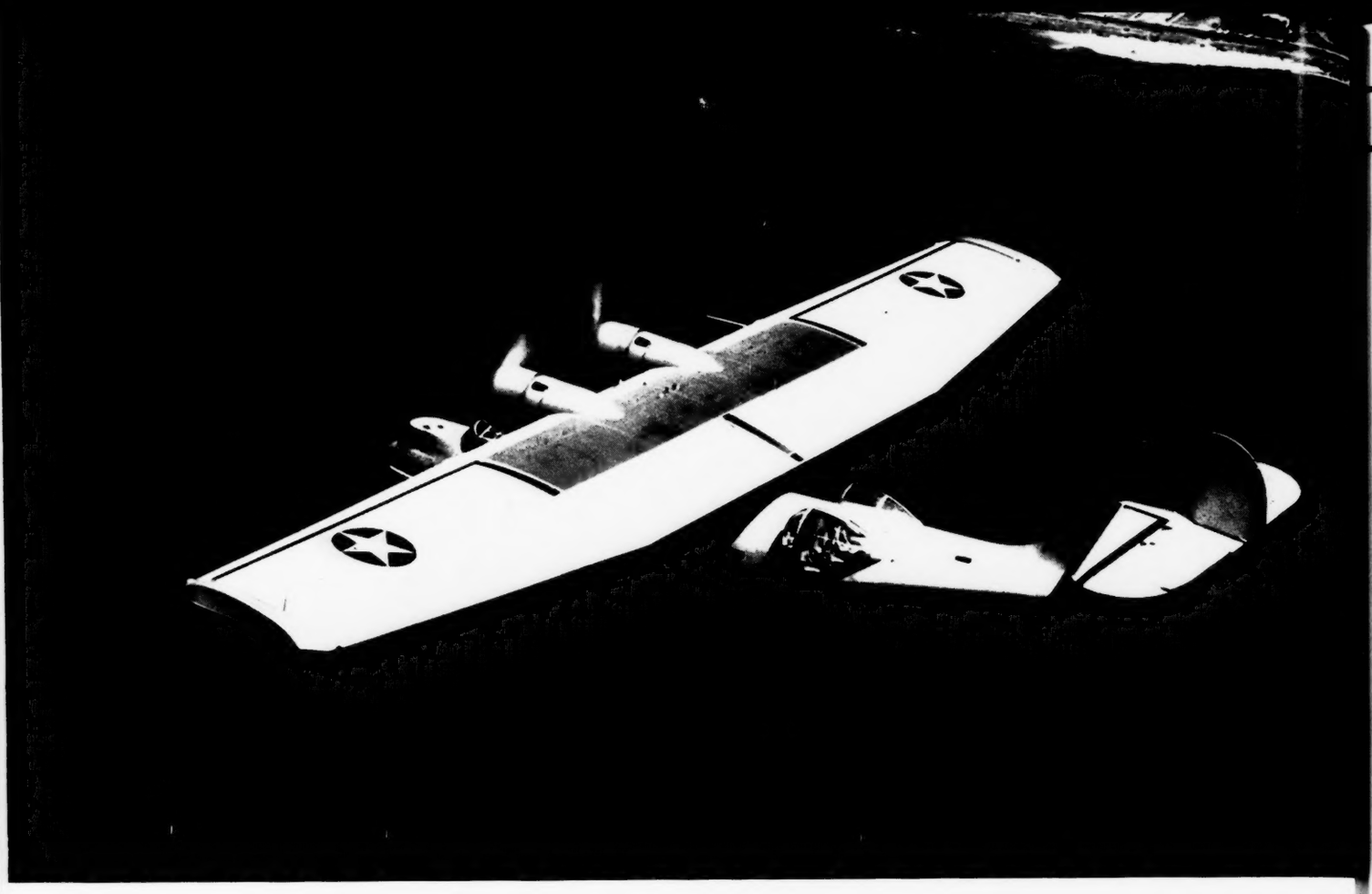


★ WAR INDUSTRIES NUMBER ★ ★

A year ago, one month after Pearl Harbor, our first War Industries Number appeared, presenting in words and pictures a comprehensive cross-section of the important part played by heating, ventilating and air conditioning in America's war plants built during the preceding twelve months. There was every reason to be proud of the notable accomplishments of our industry during 1941 in aiding the production of war material.

It is no reflection whatever on those accomplishments that they become pale in comparison with those of 1942—the twelve months following Pearl Harbor. In that period America really got to work. In innumerable cases, the spectacular production records of November, 1942, referred to by Donald Nelson the other day, were the result of teamwork in which heating, ventilating and air conditioning played a small but vital part. More than ever before in history atmospheric control in process and production applications has demonstrated its essentiality.

This second War Industries Number, then, is devoted to our industry's further great contributions to the war, and brings into focus the 1942 technological developments. It has been made possible by the cooperation of busy engineering offices, manufacturers and finally by splendid cooperation of the War and Navy Departments.



Consolidated Aircraft Corporation

★ ★ ★

has one of the world's largest industrial air conditioning systems in its Southwest bomber plant. Zoning permits highly precise control of temperatures in both winter and summer in well-insulated structure. Chilled and hot water carried from central power house to buildings in same piping.

THE Consolidated Aircraft Corporation's bomber plant somewhere in Texas is considerably more than the world's largest air conditioned industrial plant. Among the notable features other than size are (1) the flexibility of the system providing completely controlled conditions, including the air conditions, lighting, and acoustics; (2) the unusual extent to which this plant was insulated; (3) the installation of specially-designed outlets intended not only to prevent drafts when cooling, but to force the heated air into the working zone from 40 ft heights; and (4) the method of operation by which indoor summer temperatures are raised to reduce shock at shift-changing periods.

The project includes the extraordinarily large assembly plant completed early this year, a parts plant, hangar, cafeteria, office building, and a power plant. In numerous respects the complete plant represents one of the outstanding achievements of the country's construction industry, as well as of the airplane industry.

Central Plant

A separate power plant contains not only the gas-fired boilers *each* having a capacity of approximately 100,000 lb of steam per hr, but 12 steam-turbine driven centrifugal refrigerating compressors, using Freon 11 as the refrigerant. The compressors are coupled directly to the turbines. Vacuum in the steam condensers is maintained at 26 in. for peak load periods by condensing water pumped from a distant lake. The condensing water, which has a maximum temperature of 85F, is pumped from the lake through refrigeration and steam condensers in series, then returns by gravity to a point a half mile from the

This article approved for publication by the War Department

intake. Chilled water is pumped from heat exchangers in the power house to coils in the fan units described presently.

The boilers are gas-fired; steam for heating is furnished to heat interchangers (also located in the boiler house), from which hot water is circulated to the various buildings for heating through the same piping used for the chilled water when cooling.

Heating and cooling for the various buildings are both controlled from a 35 ft long central control panel in the boiler house.

Zoning

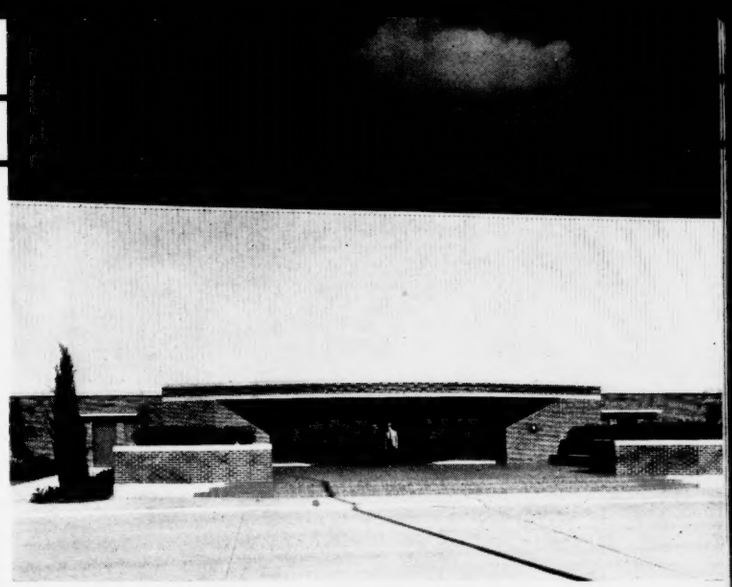
The Consolidated plant probably represents the ultimate in zoning of heating and cooling up to the present time. Sun heat ordinarily is the variable most frequently provided for in the usual zoning of a conditioned building, and this changeable part of the total load is necessarily taken into account in the Texas installation. However, night operation—not too important a factor in industrial plants prior to the war—is, in this case, an important factor, for night temperatures in the Southwest are usually sharply different from those in the day.

There were, though, still other factors taken into account in zoning the buildings of this enormous plant. The first is the not uncommon one of providing for the markedly different specific quantities of air necessary in different buildings, or even in different parts of the same building, due to (a) the different character of occupancy and (b) other internal loads, both considered in relation to the maximum capacity. This is another way of saying that the load factor varies widely from zone to zone. The second factor—and an important one—is that during a fairly large proportion of the time the weather in the Southwest is neutral; that is, there is no need for either heating or cooling. This neutral phase as often as not, occurs when the temperature is changing from a heating to a cooling period, or vice versa. It is desirable that such spaces as pass through the neutral phase simultaneously be grouped as far as possible.

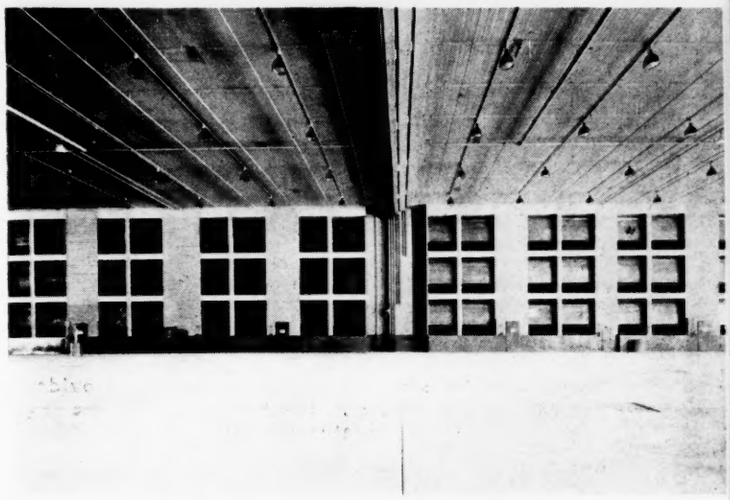
Insulation

The subject of zoning leads logically into a discussion of the building insulation used in this plant, because with a highly insulated structure the time of occurrence of the neutral phase in different sections of the plant approaches more nearly that of being identical than if no insulation were used.

In the past it seems that insulation has perhaps not been given the attention it deserves in commercial and industrial building design, probably because it is only recently that it has been fully realized that other factors than economics are seriously involved. In this particular plant an insulation thickness of four inches was indicated as the most economical thickness. This is the conventional application of glass or rock wool to houses but, except-

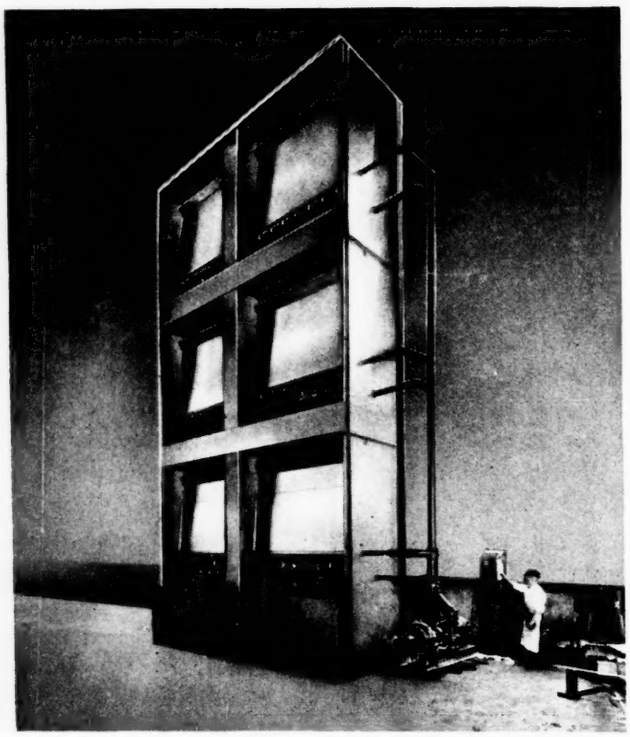


Wartime restrictions required the elimination of all identifying signs, as seen on this view of the main entrance of the Texas plant of the Consolidated Aircraft Corporation.



Exhaust units which clean the paint-laden air and discharge it to the outside. Also see illustrations of paint spray cleaning system on pages 32 and 34.

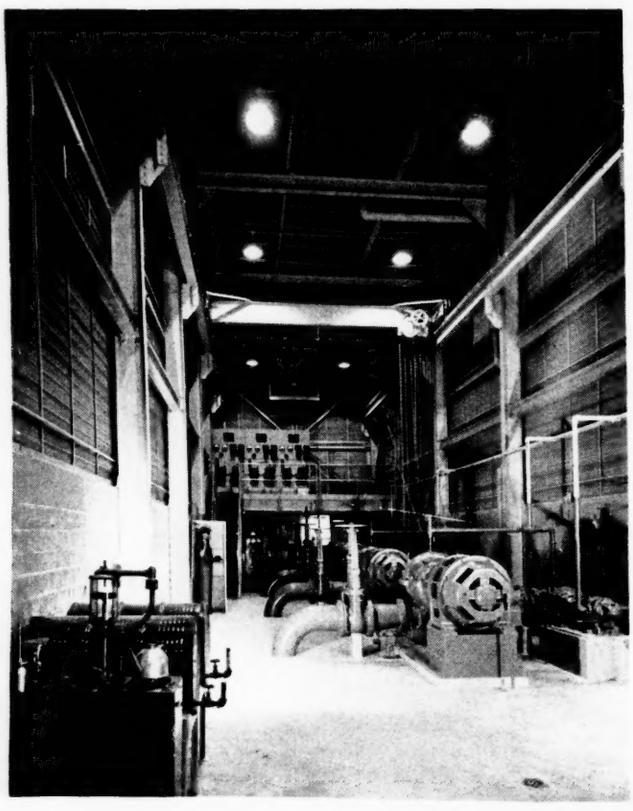
General view of the controlled conditions aircraft plant of the Consolidated Aircraft Corporation.



One of the exhaust units in the paint spray enclosure in the fabricating shop prior to installation. A view of these units assembled appears on page 31.

ing for broadcasting studios where acoustics is a controlling factor, such a thickness is almost unheard of in industrial plants. Both comfort and operating performance are advantageously benefited by this

Water for the air-conditioning system is provided by pumps located adjacent to the source of the plant's water supply.



thickness of insulation in the Consolidated project as follows:

(1) Both summer cooling and winter heating loads are substantially decreased;
(2) With wall heights from 12 to 65 ft, cool downdrafts in winter along the walls are to be expected and these are offset ordinarily by coils or radiators along the walls. Adequate insulation, by increasing the wall surface temperature, makes it possible to omit the wall heating surface;
(3) Raising the inside wall temperature in winter greatly increases the feeling of comfort by reducing the radiation of heat from the bodies of the occupants;
(4) The time necessary to cool the mass of the structure and the air inclosed within it is considerably shortened;
(5) The four inches of insulation in the roof materially reduces the heat gain from the hot roof in summer to the cool air supply ducts located directly under the roof.

The insulation consists of an alternate layer of glass fibers and vapor-seal paper bonded together by asphalt, and combined with steel channels, roofing sections and metal lath to give the best possible combination of strength, acoustical, insulating and light reflecting qualities. A 13 in. curtain wall of face brick and acoustic block rises to a height of 12 ft around the base of all buildings. The special insulated metal wall extends from that point to the roof, 65 ft from the ground. Glass insulating board continues to the base of all walls to insure control of condensation.

Fan Units and Air Distribution

Chilled water from the power plant is fed to groups of fan units in the various zones and buildings. Each of these consists of two fans, cooling coils, heating coils, air filters, and connections to the ductwork, of which there is a total of 18 miles in the project.

Since a requirement was that air conditioning equipment in the Assembly and Hangar buildings had to be located not less than 40 ft from the floor, all of the fan units and ducts are located in the truss space below the roof. Generally, in the Assembly building the equipment was fitted into 25 ft wide truss spans and one unit supplies proper summer and winter conditioning over a floor area of approximately 64,000 sq ft. Two fan units are located on each deck, each serving an adjacent hundred lineal feet, each comprising a zone. Along the walls and two ends of the main building are additional "exterior" zones. This "exterior" strip of zones is 15 ft wide, and has volume-damper control of the cooled air, and steam coil control during heating periods so as to provide uniformity of conditions in these difficult areas. As mentioned, the insulation aids in reducing cold air drafts along the walls; in addition, the temperature in the wall zones is kept slightly high to offset draft sensations by booster coils.

It was felt by the designers that no available type of outlet could satisfactorily meet the difficult requirement of handling both heated air or cooled air without drafts when introduced at a 40 ft height, especially since it seemed imperative that the heated air must be thoroughly forced down into the floor zone if, due to an emergency shutdown, the building should ever become extremely chilled. As a result, a dual type of outlet was developed by which the direction of air flow is changed automatically by mechanical control actuated by the temperature of the air flowing. Each outlet serves a floor area of approximately 2000 sq ft.

The problem of obtaining satisfactory air distribution was complicated by the large doors in the Assembly building. These vary in size from 19½ x 23 ft (450 sq ft) to 195 x 40 ft (7800 sq ft). In the Hangar there are a number of the 7800 sq ft doors. When a pair of these are open on opposite sides of the building, the heating problem is almost that of heating a very large building with two of its sides removed. Consequently, powerful, closely-spaced, down blast, dual nozzles are used for winter heating adjacent to these doors.

Ventilation

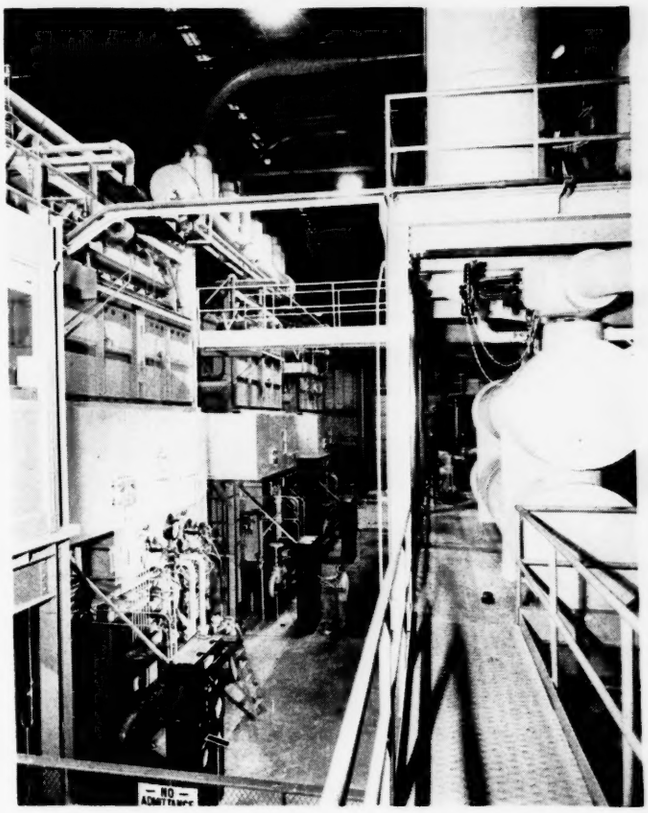
Provision has been made in this plant for a paint spray structure large enough to permit the painting of the completely assembled bombers. No paint spray buildings of equal size have ever before been constructed. The enclosure in which the assembled planes are painted is 150 by 200 ft in plan and 35 ft high. A partition which can be lowered from the ceiling to the floor makes it possible to divide the enclosure into two sections, each large enough to handle an entire plane.

The ventilating system designed to exhaust the paint-laden air, and replace it with washed and filtered air, was necessary both to protect those handling the spray nozzles from spray and fumes, and to eliminate the fire and explosion hazard. The system draws 700,000 cfm of air from the outside, then washes, heats and filters this air, draws it across the enclosure, washes out the pigment, and finally exhausts the air to the outside. There are eight air supply units and eight exhaust units.

For every pound of paint sprayed, there is supplied 5250 pounds of air and 6466 pounds of water. This is said to be about five times the paint-air-water ratio of comparable commercial installations. It takes a crew of six men about two hours to paint a plane. Twenty-five gallons of paint are required.

All equipment for the air supply units is mounted in the roof trusses, taking outside air from near the roof line. Fans draw the air in through automatic inlet louvers. After being tempered by steam coils, washed, and re-heated to a controlled temperature of 80F, the air is evenly distributed over the entry wall through a system of dampered ducts.

Admission of the air into the spray enclosure is then made through replaceable glass fiber air filters, arranged in 16 vertical bay panels, each containing

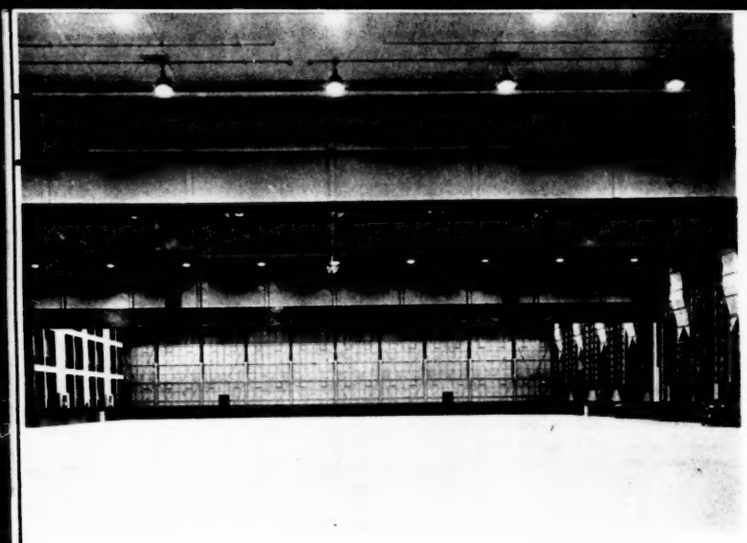


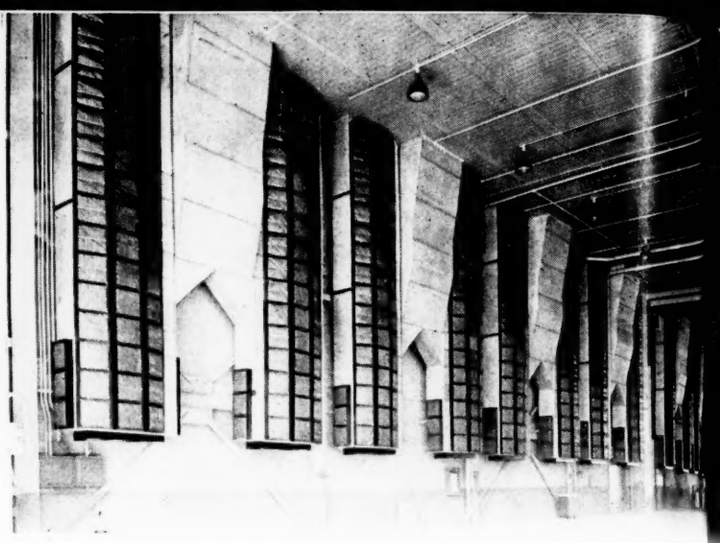
Gas-fired boilers provide steam for the heating system and operate the steam-turbine-driven refrigerating compressors for the air-conditioning system.

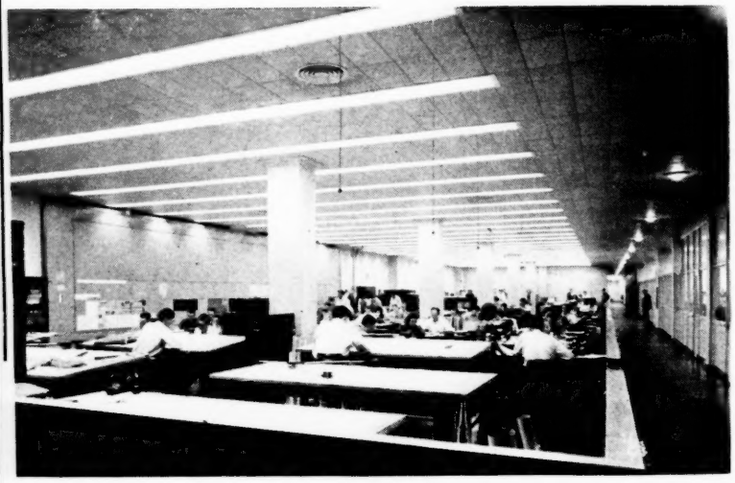
57 filter cells. Each cell provides room for 4 filters. Thus 3,648 filters are employed to strain the air entering the enclosure.

The eight exhaust units are arranged to draw the

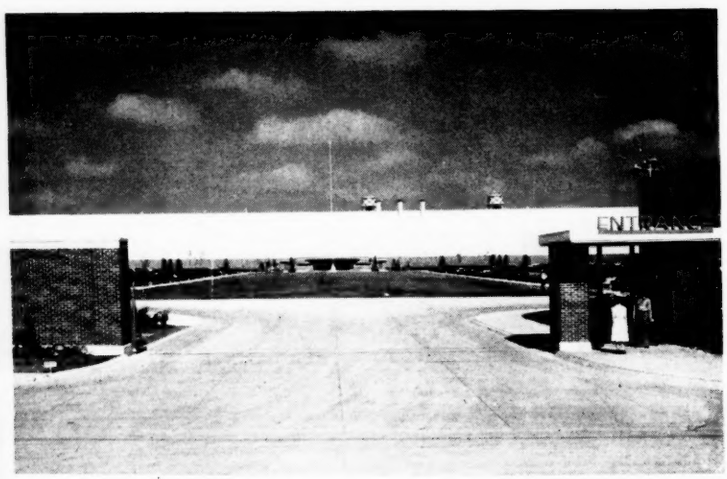
Air outlets are barely distinguishable in the trusses. Mezzanine shown at left of the assembly floor.







(Top, left) Filter panels in the paint spray enclosure through which the washed, warmed and filtered air enters, are at the right, exhaust units at the left. (Top, right) Glass fiber air filters arranged in 912 cells, each cell containing four filters, line the wall through which the washed, warmed and filtered air enters the enclosure. (Upper left center) Air conditioning ducts in this engineering office are concealed above the suspended metal acoustic ceiling. (Lower left center) Main gate of the bomber plant. Plant personnel officers are next to the gate at the right. (Bottom left) Rectified fluorescent lighting is reflected up to the under sides of the wings and fuselages by the white cement floor. Air conditioning fan units are located above the trusses. (Bottom right) Temperature and humidity throughout the world's largest air-conditioned industrial plant are indicated on and regulated from this central control panel, shown on the right. One of the boilers is shown in the background.



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THIS PROJECT

designed and built by

The Austin Company

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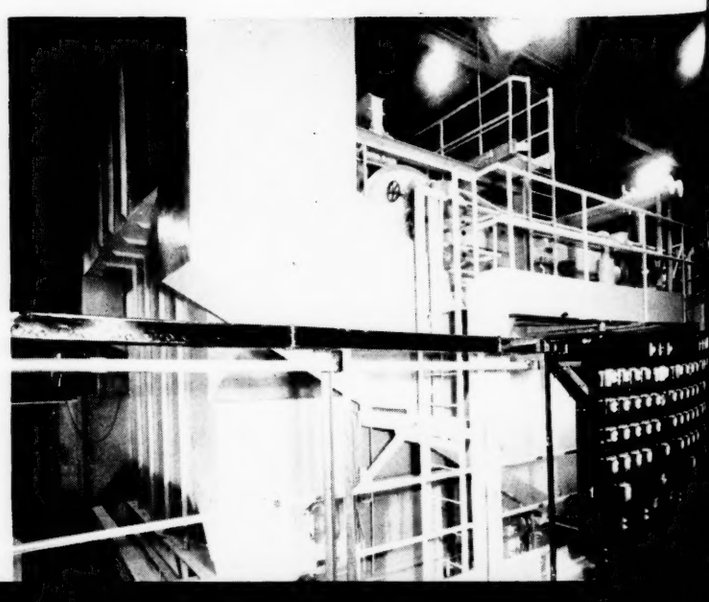


air out at three levels, thus helping to maintain even distribution. Each section of each unit has a constant flow of water over its flood sheet, the surface exposed to the room.

An exhaust fan, located outside of each unit, draws the paint-saturated air through a series of conical, high-pressure water sprays, confined in circular orifices. Centrifuge tubes completely separate the water and sludge from the air and deposit them in a sludge tank below, so that only clean air passes through the exhaust ducts and fan.

The sludge tank for each unit holds 2000 gallons of water. The water in these tanks is continuously re-circulated through the units by pumps mounted on the floor in the spaces between them. The only loss of water is from evaporation. Water spray nozzles are in plain sight and readily accessible. There are no concealed eliminators that require removal for cleaning.

Should a fire be generated within the enclosure it would be impossible for it to pass through the water sprays and spread through the exhaust system. The glass fiber filters through which the clean air enters at the opposite side of the enclosure do not support combustion, and would tend to act as a barrier to fire spreading into the supply system.

The system is controlled by electric push buttons within reach from the paint floor level. Each of the supply and exhaust units is independently controlled. Any combination of the units can be operated together. Automatically controlled dampers on both the supply and exhaust units close when a unit is shut down and open when it is started up again. When no painting operations are in progress, but the outside temperature requires heat in the structure, about 10% of the capacity of the supply air is drawn in through one unit to maintain a working temperature.

Steam is delivered to the paint shop for the spray sections under an intermediate pressure. Condensate is flashed locally, and the flash steam used for heating all the ventilation air for the cleaning section and other smaller ventilated quarters. There is an excess of this flash steam, however, some of which is used to run a turbine-driven condensate return pump.

Operation

The central control panel contains 200 switches, gauges, and instruments. It occupies a location on a high mezzanine astride the middle of the equipment room, between the boiler end and the refrigeration end. The operator has full view of all operations from the control deck. The chief operator supervises and controls operation of the refrigeration plant, and the distribution of heated and cooled air from this board. He establishes temperatures throughout all buildings, by setting each of the zone control thermostats. The temperature results obtained at each of these zone controls are indicated electrically on the board. The operator at this panel accomplishes more in establishing, re-setting and checking conditions than could perhaps be effected by twenty men without it.

The board automatically shows what equipment is in operation. Signals show vital shut-downs. The more important temperatures are recorded. When any of the very large doors are opened, a signal lights for that particular door, so that, by 'gunning' the control for the door-zone involved for a period of time, especially in winter, conditions may be restored as rapidly as possible.

One of the most important considerations in air conditioning practice is the prevention of over-cooling in warm weather. This is effected manually at the central control station. An hour before the change of the shift, the temperature is scaled upward to avoid shock to those entering and leaving. When the new shift is on, the temperature is brought back, over a period of about an hour. Thus the entering-leaving shock is minimized to the maximum extent.

Each of the twelve refrigerating units is protected by nine shut-down automatic safety controls. In the event of failure, a red light shows up at that particular compressor, and a corresponding signal lights on the control panel.

For economy, steam for heating is re-used in several instances. The Hangar Building is heated by low pressure exhaust steam from the boiler auxiliaries. This low pressure steam is passed through heat exchangers, heating the coil water which is recirculated through underground piping from the boiler room to the Hangar building.

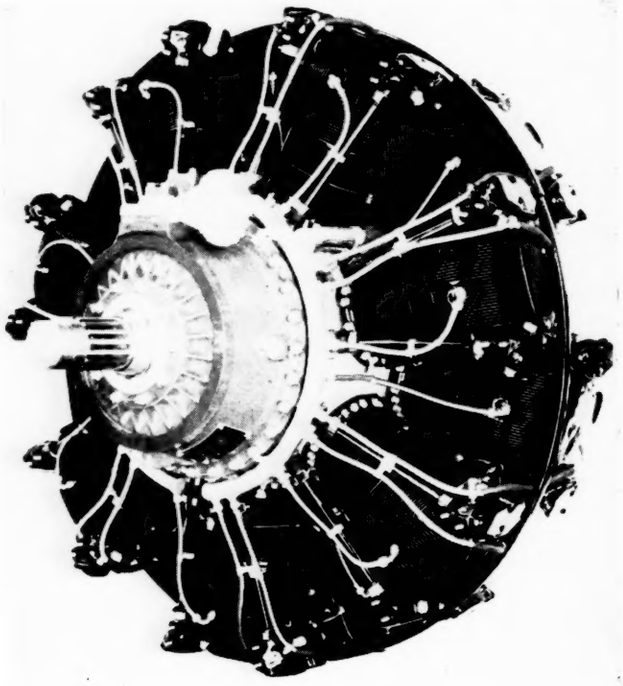
The Assembly building is heated with hot water supplied through the medium of heat exchangers. The steam for the heat exchangers is taken from the main boiler header and is controlled by a pressure reducing valve set at medium pressure to heat the hot water in the heat exchangers.

Supplementary heating is provided by a number of booster steam coils installed in the duct work at various locations to equalize the temperatures in the exterior zones along the wall surfaces when required. The booster coils also provide necessary heat during moderate weather when only a small amount of heat is necessary, without resorting to the main heating coils.

The buildings comprising this outstanding project, complete with all mechanical and electrical facilities, were designed and built by The Austin Company, Cleveland, under the supervision of the U. S. Corps of Engineers. A partial list of the equipment suppliers is as follows:

Steam generating units	Riley Stoker Corp.
Water heaters and heat exchangers	J. A. Coy Co.
Refrigerating equipment,	Worthington Pump & Machine Corp.
Chilled water pumps	Ingersoll-Rand Co.
Air conditioning controls	Johnson Service Co.
Fan units	Buffalo Forge Co.
Automatic air filters	American Air Filter Co.
Fan-motor starters	Allen-Bradley
Paint spray sections	R. C. Mahon Co.
Paint spray filters and building insulation,	Owens-Corning Fiberglas Co.

Wright



Wright Cyclone 14 aircraft engine

A COMPLETELY windowless plant, yet one so well equipped for ventilation and lighting that even during total blackouts its many thousands of employes can continue working in comfort and with no slackening of pace in the production of the engines so vitally needed by our fighting air forces—such, briefly, is a description of the Wright Aeronautical Corporation's new Cyclone engine plant rapidly nearing completion in New Jersey.

Financed by the Defense Plant Corporation, designed and engineered by Albert Kahn Associated Architects and Engineers, Inc., and Eggly Engineers, working in close collaboration with Wright Aeronautical Corporation and Government engineers, and built by use of the recently developed and amazingly fast technique known as "Warspeed" construction, this plant forms an important new link in the Nation's vast chain of production facilities which will eventually crush the Axis. The speed with which the project was conceived and carried through to completion is illustrated by the fact that, on the same ground which early last spring yielded a substantial crop of early vegetables, there stood in October a huge new manufacting plant, not complete, but far enough along to permit the start of actual production machining operations on many parts of the famous air-cooled aircraft engines.

Unique Construction

Warspeed construction is the term applied to a new method of concrete construction applying to slabs and supporting beams and columns— a war development used for the first time, it is believed, on this project, and arising from the acute need for savings in time, critical materials and skilled labor. It utilizes large prefabricated and portable sections of formwork, made up in self-supporting units which rest on temporary wood sills or rails and which can be moved from one pouring position to the next by means of tractors. After completion of a pour, 40 hours are required to cure the concrete to a sufficient strength to carry its own weight. The forms are then lowered a short distance by means of jacks and moved to the next pouring position. As many as ten pours can thus be made from one form. The process naturally requires a large, uniform type of construction for its practical and successful use. In this new Wright plant, this method was used in the main, or manufacturing building, which is one of the three principal units of the plant, the other two being the powerhouse and test cell building, respectively, which are under construction as this is written.

The large area and uniform layout of the main building made this an ideal application of the new method. About one acre of concrete roof was poured per day. The main manufacturing building has concrete floors, columns, and roof, and brick walls; and, as previously mentioned, is windowless throughout. The floor is covered with creosoted wood blocks, except under heavy machinery or where damaging process conditions exist. A covering of rockwool insulates the roof, and a built-up composition covering rests on the rockwool. All ventilating air is taken in through overhead horizontal ventilating units except in the case of the offices and engineering section, where the intakes are through vertical wall ventilating units. Exhaust ventilation also is taken care of through roof units, and all such openings to the outside are equipped with lightproof louvers which make the plant capable of operating at 100% capacity under blackout conditions. Hundreds of square openings, uniformly distributed over the entire area, were provided in the roof for these exhaust and supply air units, as well as for process exhaust ventilation. High intensity lighting is employed throughout.

Across one entire end of the main building is a mezzanine enclosure which contains the plant office and engineering departments. The rest of the entire area of this one-story structure is devoted to the various manufacturing departments. Beneath the mezzanine office and engineering department is space for rough storage, the storage of maintenance materials, and a materials laboratory. In the basement below a portion of this manufacturing area are lava-

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Aeronautical Corporation

builds Cyclone engine plant in New Jersey equipped with blackout ventilation; heating and ventilating supplied by unit ventilators suspended from ceiling; numerous local exhaust systems serve grinding, heat treating, plating and other processes.

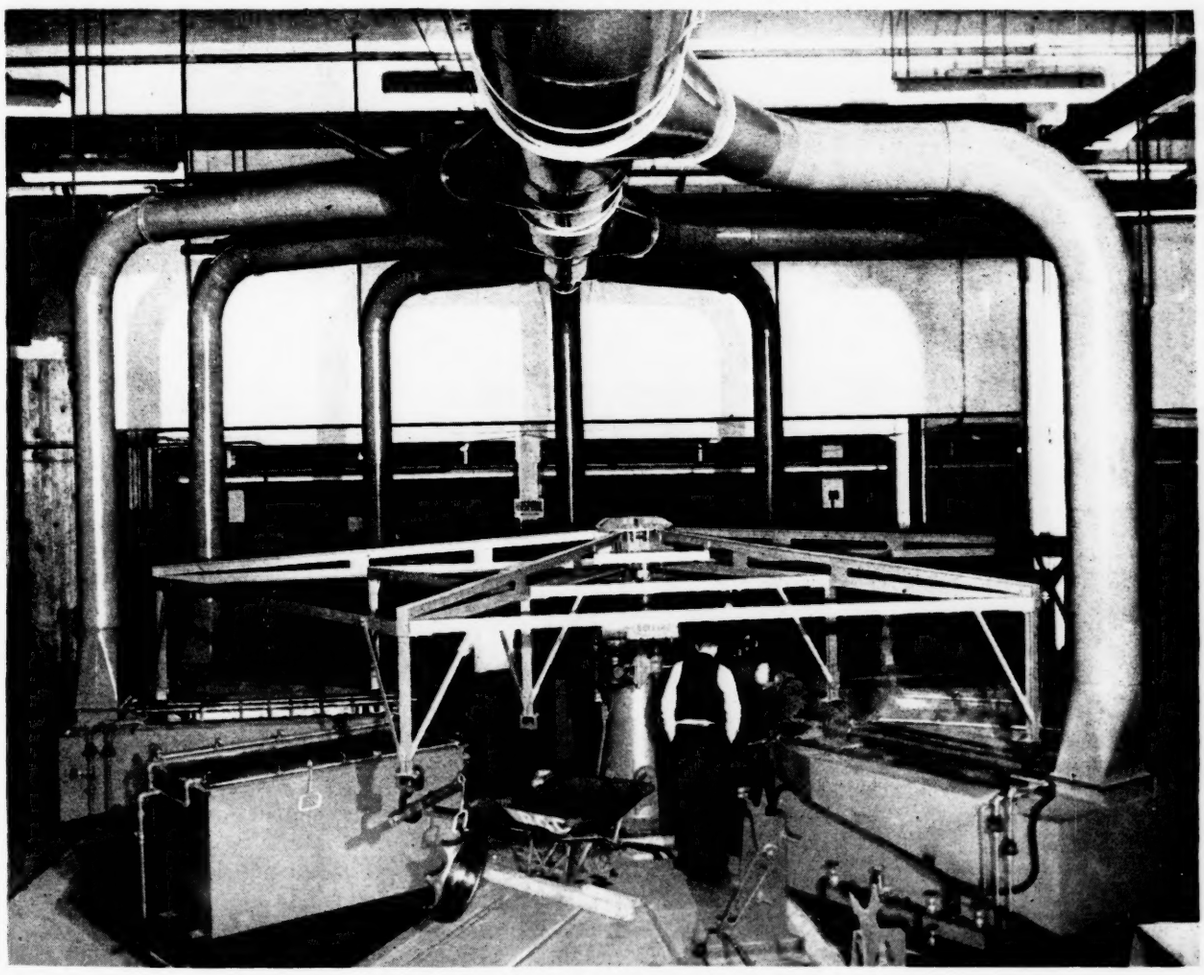
By R. N. HOSEY
Associate Editor, HEATING AND VENTILATING

tories, locker rooms, a cafeteria, a main entranceway, and hallways with stairs leading to the main floor departments.

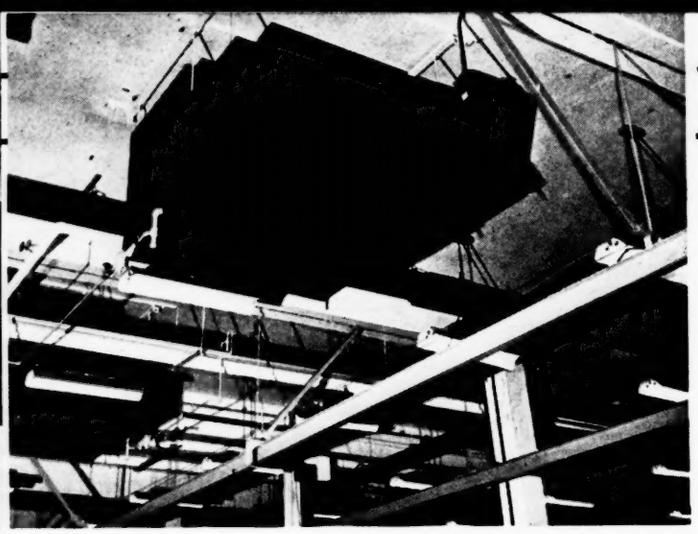
Power Plant

The power plant, when completed, will house three 3-drum 925 hp Babcock & Wilcox Stirling boilers of 80,000 lb per hr evaporative capacity each and one single drum 1250 hp Union Iron Works boiler rated at 100,000 lb per hr. A Westinghouse underfeed stoker will be used on each of the boilers. Steam will be generated at 175 lb pressure and piped through two 12-in. all-welded mains which pass through a pipe tunnel to the main manufacturing building where the pressure is to be reduced to 100 lb and the steam distributed from there throughout the building at that pressure. Governors, located at various points, will reduce the steam to either 40 or 25 lb as required for process work or space heating. All steam supply and return piping used throughout the entire plant is of welded construction.

A temporary source of steam for process require-



One of the three Bullard-Dunn electro-plating units. Here Cyclone engine parts are cadmium plated by dipping successively in seven different tanks by a rotating conveyor mechanism. Slots along the sides of each tank draw off fumes into the overhead exhaust system which is connected to a No. 6 Buffalo Forge Company fan exhausting through the roof. Leakage of electric current from tanks to ground is prevented by a Bakelite gasket in the duct connecting piece, and by Barco insulating couplings in the steam and water lines.



A typical suspended type heating and ventilating unit of 15,000 cfm capacity, 225 of which are used for heating the manufacturing area and introducing outside air as required. Louvers and light-proof hoods on the roof above eliminate any possibility of light leakage outward.

ments and for building heat was arranged for by using a railroad locomotive, as shown in one of the photos. Tied in to the overhead distribution system in the main building, this unit furnished all the steam necessary during the early stages.

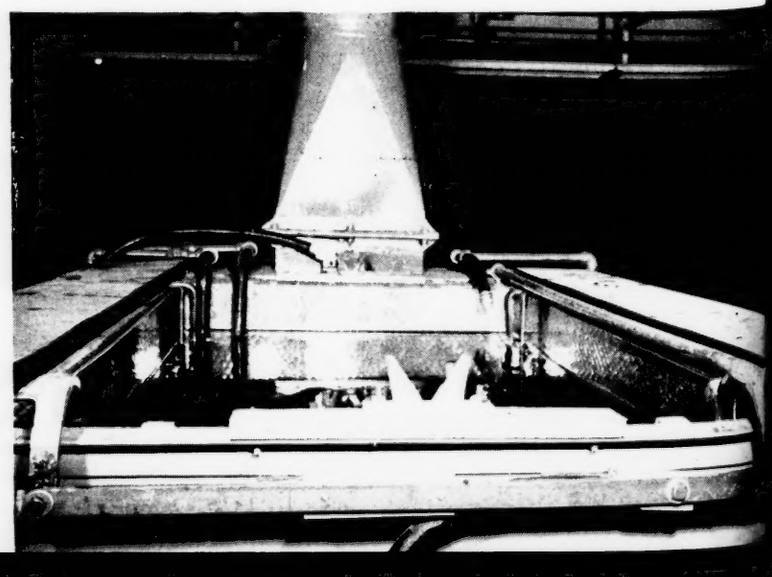
Office Ventilation

The heating and ventilating of the mezzanine office and engineering section is taken care of by means of Nesbitt Syncretizers located on the floor along each side wall of the long room. Those located along the north wall, which is an outside wall of the building, bring in fresh air as required direct from the outside through lightproof louvered openings; while those along the opposite wall draw in their fresh air through a plenum chamber which is supplied with tempered air brought in through roof unit ventilators located in the main factory area. This air is delivered at about 65F to the plenum chamber. Each of these ventilating and heating units is equipped with linked fresh air and recirculating air dampers operated by a damper motor through a delivery air thermostat at the heater outlet. When the temperature of the air leaving the units exceeds the thermostat setting the fresh air damper automatically opens and admits sufficient cold air from the outside to restore the temperature called for by the thermostat, ventilation being thus accomplished at the same time. A certain minimum amount of fresh air is continually brought in by the units. The room temperature is controlled by zones through the action of Johnson thermostat located on nearby building columns, with one thermostat for each heating unit. A diaphragm steam valve at each heater admits steam as called for by the room thermostat to maintain room temperature. Exhaust ventilation from these departments is by means of propeller type roof ventilators, manually-controlled, similar to those in the manufacturing area, described later.

Factory Heat and Ventilation

Every bay of the manufacturing area has one of the roof openings previously mentioned, some of these being covered with flat wooden covers with the process exhaust piping from various departments running up through the covers. These exhaust stacks extend up above the roof and have no weather caps. The high discharge velocity of 2000 fpm or higher serves to carry particles from the grinding and spray booths high enough into the air to be effectively dispersed. The remainder of the openings are covered by lightproof sheet metal hoods. Some of these serve as air intakes and some as exhaust outlets. Fresh air as well as heat for the building is supplied through some 225 horizontal type heating and ventilating units suspended from the ceiling of the manufacturing area directly below the openings. These units filter the air and discharge it downward at an angle into the working area. Their linked fresh air and recirculating dampers are automatically controlled by a damper motor which is positioned by a duct thermostat at the heater outlet. When the outside air temperature drops too low the duct thermostat automatically shuts off the fresh air damper and opens the recirculating damper. Area temperature control is obtained in the factory area

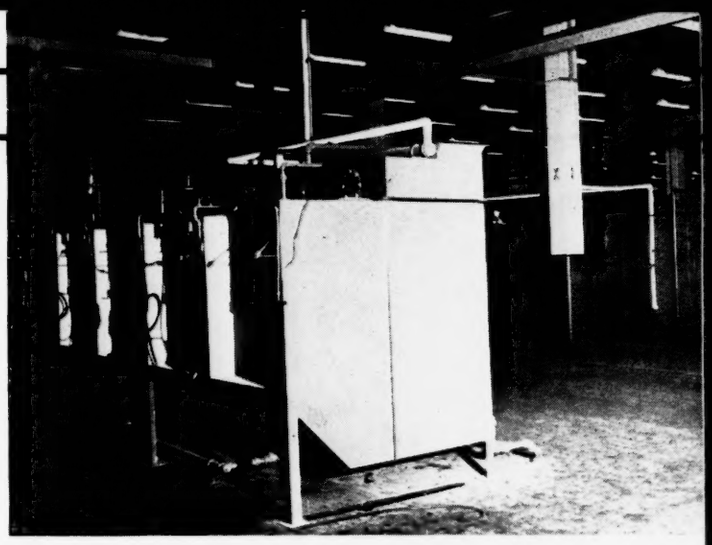
(Left) The mezzanine office and engineering department of the Wright Aeronautical Corporation is kept comfortably heated and ventilated by Nesbitt Syncretizers shown along the wall behind the desks. Heat from each Syncretizer is controlled by a corresponding Johnson thermostat located on the adjacent column, zone temperature control being thus provided. (Right) One of the solution tanks on the Bullard-Dunn electro-plating machines at the Wright Aeronautical plant showing the ventilating slots along the sides which draw off fumes and exhaust them out through the vertical stack.



by means of Johnson thermostats located on the columns near the floor in the path of air discharged from the overhead units. These units are 15,000 cfm capacity each and have three blower wheels mounted on a common shaft which is belt driven by a 3 hp double-wound two-speed motor. High speed is used for summer work, when it is desired to bring in a maximum amount of fresh air for ventilation, and the lower speed is used for winter operation. The fresh air damper in the unit covers only about 75% of the total fresh air area, the other part having a manual damper which is set to give a certain minimum amount of fresh air during cold winter weather. These overhead heating and ventilating units are set in rows in alternate bays running across the entire length of the plant. Between each row of these units there is a row of propeller type exhaust ventilators which also are located at the roof openings. These fans are manually controlled from starting switches located on the columns near the floor, but are equipped with louvres powered by air operated damper motors which operate in unison with the fans, the louvres closing when the fans are idle. The entire system is designed to provide 6 changes of air per hour in the summer time and 3 per hour in winter.

Process Ventilation

Process work in the main factory area requiring ventilation consists of electro-plating, grinding, naphtha spray cleaning of parts, sand blasting, and heat treating. There are three Bullard-Dunn cadmium plating machines each with it own ventilating system. These plating systems consist of a circular grouping of seven solution tanks into which the work is dipped automatically by a rotating conveyor mechanism, which has an up and down step action as it revolves. Each of the seven solution tanks is heated by steam at 40 lb pressure and supplied with electric current for plating, and each tank is ventilated by slotted ducts located close to the liquid

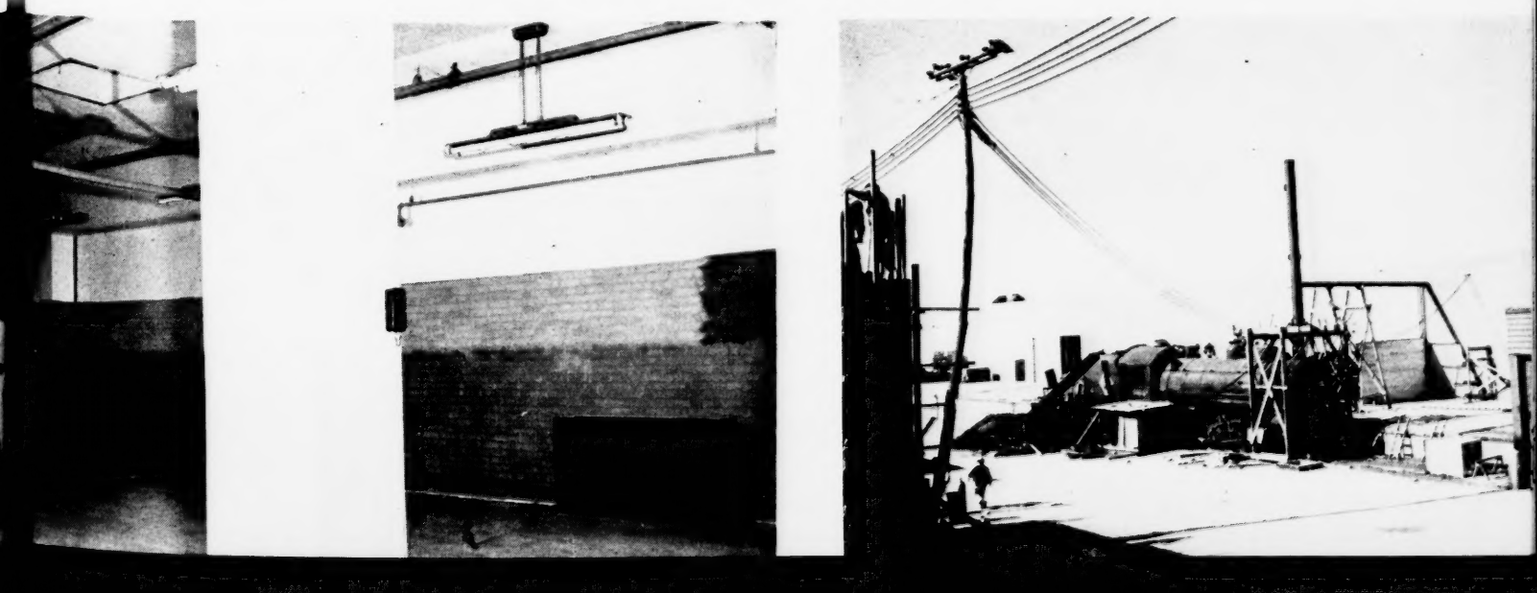


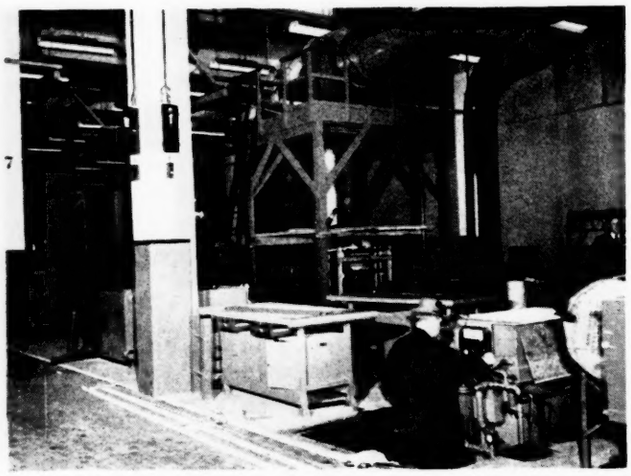
View of two Hydroclone burr benches and (at the far left) an accompanying naphtha spray cleaning booth. Burrs, fins or other projections are ground from Cyclone crank-cases and other parts in the Hydroclone booths, most of the grindings falling directly into the water tank below.

level along each side, the fumes being drawn off through these slots into a common 12 in. exhaust stack. The seven exhaust stacks are brought together overhead into a central header which leads to a No. 6 Buffalo Forge limit load fan powered by a 15 hp 1740 rpm motor. This fan and motor are mounted on a wooden platform, wood being used in this case to conserve critical metals. The electroplating tanks are electrically insulated by ½ in. Transite spacer gaskets from the 12 in. black iron exhaust stacks mentioned. Water and steam piping are also electrically insulated from the tanks by means of Barco insulating couplings.

Located in a number of departments throughout the plant are groups of Hydroclone burr benches, or grinding booths, built to the Wright Corporation's own design and used for grinding fins, burrs, or other projections from crank cases and other parts. These booths draw the dust-laden air away from the operator, wash it free from grinding dust by passing it through two water sprayed sections, then return it to the room. Most of the grindings fall directly into a water pit below the grid on which the work rests. No fan is required to produce this air

(Left) A newly completed portion of the mezzanine office and engineering section at one of the plants of the Wright Aeronautical Corporation showing the heating and ventilating arrangement. The Johnson air-operated thermostat on the column controls the diaphragm steam valve on the nearest Nesbitt Syncretizer along the wall, thus controling room temperature for that particular zone. (Right) view of the locomotive used as a temporary source of steam, pending completion of the new power plant, which will be equipped with three 925 hp and one 1250 hp stoker-fired boilers, generating at 175 lb pressure.





(Left) On the wooden platform, wood being used in order to conserve critical materials, is shown the Buffalo Forge exhaust fan which ventilates one of the Bullard-Dunn electroplating units. (Right) Hundreds of square openings were provided in the concrete, rock wool and composition roof. Light-proof hoods, used either for fresh air inlet or exhaust outlet purposes, cover most of these. The remainder have wooden covers, and some of these covers are pierced with process exhaust stacks which exhaust at velocities of 2000 fpm or higher.

movement as it is induced by the action of the sprays discharging through a venturi shaped passageway. Each Hydroclone unit is equipped with a 10 hp, 3500 rpm Allis-Chalmers pumping unit with a 2½ in. by 2 in. type SSHD pump of 150 gpm capacity at 150 ft head. After grinding, it is necessary that all grinding dust, oil or other dirt be removed from the parts. This is accomplished by spray washing with naphtha in special booths designed for the purpose. Each Hydroclone group, therefore, is accompanied by one naphtha spray booth and each of these booths is equipped with a No. 24 Buffalo Forge volume blower powered by a one hp totally enclosed 1750 rpm, 440 volt, 60 cycle, three-phase belt driven motor. The discharge from these fans is carried up through individual black iron exhaust stacks which pass through the 4 ft square roof openings and wooden covers previously mentioned.

Ventilation in the heat treating department is furnished by the same arrangement of overhead ventilating and heating units as used in the other departments, and with the same kind of propeller fan exhaust units. Ample air changes are provided for the dissipation of heat and gases from the furnaces. A battery of sand blast booths is located here, and the fan discharges from these booths are carried up through black iron exhaust stacks which pass through the wooden covers on the roof openings.

Although there is a vital and urgent need for the Cyclone engines which this plant turns out and, for that reason, the use of critical materials in the construction and equipping of the plant might have been justified much more easily than in certain other war projects, it is worth noting that every effort was made throughout to hold the use of such materials to an absolute minimum. This is illustrated in the use of wooden covers over the hundreds of roof openings; wooden fan platforms with ladders made of the same material leading to them; and high velocity black iron exhaust piping stubbed off about 6 ft above the roof, in place of the customary lower velocity—therefore, larger size—alloy or corrosion-proofed stacks leading high above the roof and topped with weather caps; all of which have been touched upon. In addition, all fresh air inlet and exhaust ducts used in the basement rooms, including lavatories, locker rooms, and cafeteria, are of Masonite. These ducts are rectangular in shape, made of flat sheets, the only metal required being for the special corner angles prefabricated from black iron sheets, and the metal screws or rivets for fastening. Unusual care was used also in the design and use of reinforcing steel throughout the project, the prime consideration being that all essential safety requirements be met, but likewise that there be no waste of steel for excessive and needless strength.

General contractors: Mahony-Troast Construction Company, Passaic, N. J. Heating and Plumbing Contractor: McBride, Passaic, N. J.

THIS PROJECT

Designed by Albert Kahn Associated Architects and Engineers, Inc., in collaboration with Eggly Engineers, Philadelphia.

PARTIAL LIST OF EQUIPMENT SUPPLIERS

Allis-Chalmers Mfg. Co.	Pumps
American Blower Corp.	Fans
American Foundry Equipment Co.	Sand Blast Booths
Babcock & Wilcox Co.	Boilers
Barco Mfg. Co.	Insulated Pipe Couplings
Buffalo Forge Co.	Fans
General Electric Co.	Motors
Johns-Manville Corp.	Transite Ductwork and Gaskets
Johnson Service Co.	Controls
McQuay, Inc.	Heating and Ventilating Units
John J. Nesbitt, Inc.	Nesbitt Syncretizers
B. F. Sturtevant Co.	Fans
The Trane Co.	Heating and Ventilating Units
Union Iron Works	Boilers
Warren Webster & Co.	Steam Heating Equipment
Westinghouse Electric & Mfg. Co.	Stokers, Motors
Masonite Corp. (Cellufoam Div.)	Masonite for Ducts

Part of the Behr-Manning plant, heated by a high pressure hot water system.

Behr-Manning Corporation

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installs high pressure hot water heating system and five-zone drying system to facilitate production of abrasives and war materials.

By J. O. AMSTUZ† and J. F. GSCHWIND‡

IN spite of its wide distribution and universal use, few people realize how complicated the manufacturing process of sandpaper is, and to what degree science has helped to achieve the high quality of the product today. Heating and air conditioning, too, play their part in this interesting process as exemplified in the largest plant in the world devoted exclusively to making coated abrasives—that of the Behr-Manning Corporation, a Division of the Norton Company.

Coated abrasives play a very important part in the war production; there are thousands and thousands of applications in the most divergent fields, including the grinding of heavy castings, peeling the husks of peanuts, manufacture of automobile bodies, finishing of furniture, production of false teeth, and the treating of felts.

†Chief Engineer, Behr-Manning Corp., Watervliet, N. Y.
‡Engineer, J. O. Ross Engineering Corp., New York, N. Y.

Manufacturing Process

There are three basic adhesives for bonding the abrasive to the backing material: glue, varnish and resin. The abrasives, as such, can be classified as follows: *Natural grains*: garnet, flint and emery; *artificial grains*: silicon carbide and aluminum oxide.

Many combinations are made with various bonds, grains and backings, the latter consisting of paper, cloth, or combination of cloth and paper, in various weights.

The manufacturing process begins with the grading of crushed abrasives. All grains are graded for exactness of size over silk screens. This operation is very important and is being constantly checked. The grain sizes vary anywhere between a 12 mesh and 16 microns. The latter size would require a screen with 600 mesh per inch, furnishing a product as fine as face powder. Use of such a close mesh is

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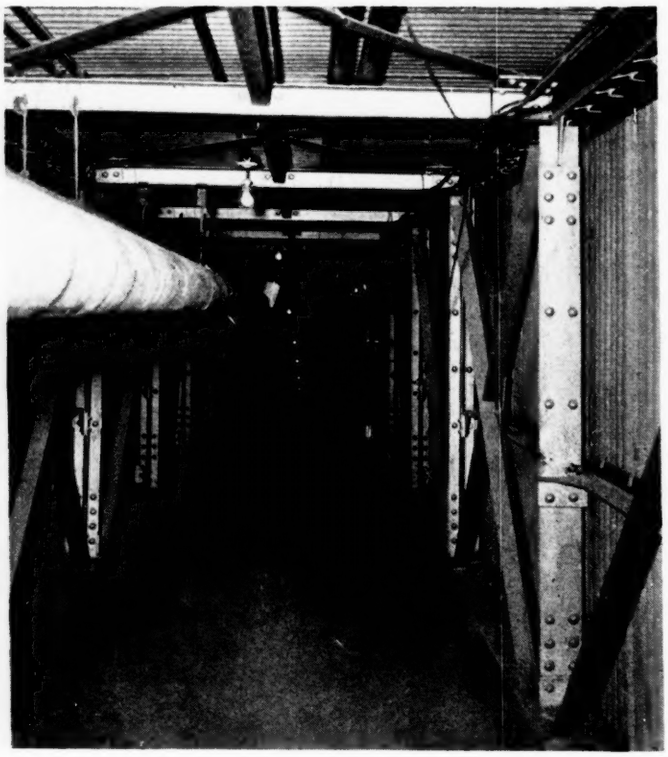


An example of long-distance heat transportation. This view shows the superheated hot-water mains, insulated by J-M 85% Magnesia, in the bridge crossing the D. & H.R.R. tracks from the power plant to a distant building.

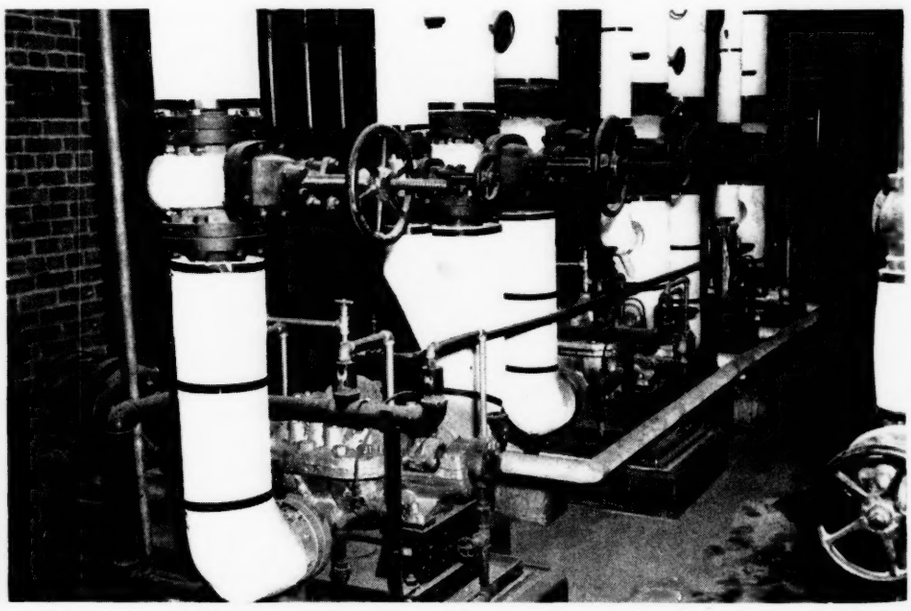
not practicable, and the finer grains are separated by air.

The bonding material, in the form of glue, varnish or resin, has, in the meanwhile, been prepared in double walled, heated kettles. The basic materials (that is, the web or backing, the coating, and the abrasive) are well assembled in one specially designed machine. The bond is added to the backing by means of calender rolls with micrometer adjustments. The sand is added immediately afterwards by one of two different methods: (1) The web travels under the stream of falling sand, evenly distributed over the full width, or, (2) the backing is guided through an electro-static field; this ingenious device not only insures even distribution, but gives the particles a definite orientation, thereby improving the cutting and wearing qualities of the finished product. Much research work was necessary in connection with the dielectric properties of abrasives before this process gave good results.

Another coat of bonding is then applied, so that the sand is firmly fastened to the web. The paper and cloth backing is then brought to the making room in large rolls, containing miles of material in a continuous web. As this is unreeled, it is delivered to the coating machine, where the sticky adhesive is applied, and where care must be taken to prevent the wet side from being touched. For this reason, festoon dryers are used for setting and baking the bond. The continuous web of backing, adhesive and abrasive, in widths of 24 to 48 in., is now hung in 10-ft. loops and carried by stick conveyors at varying production speeds through the drying tunnels, which are about 10 ft wide, 17 ft high, and 100 ft to 200 ft long. Three or four tunnels, side by side, constitute a dryer.

The many coatings and backings require different heat treatments. The ovens, therefore, are divided into zones having separate controls for temperature and moisture regulations. The required temperatures vary and can be set between 100F and 300F, while the relative humidity can be adjusted between 70% and 40%. Humidity is necessary to keep the web pliable and flat, and to prevent case hardening of the bond. Depending on the moisture content, the concentration of the solvents, etc., each oven can be operated to furnish anywhere from 0% to 100% exhaust, since the units are designed for complete air recirculation. The air conditioning and heating equipment of each dryer is centrally located and the air is distributed through insulated ducts.

Varnish and resin bonded goods are classed as



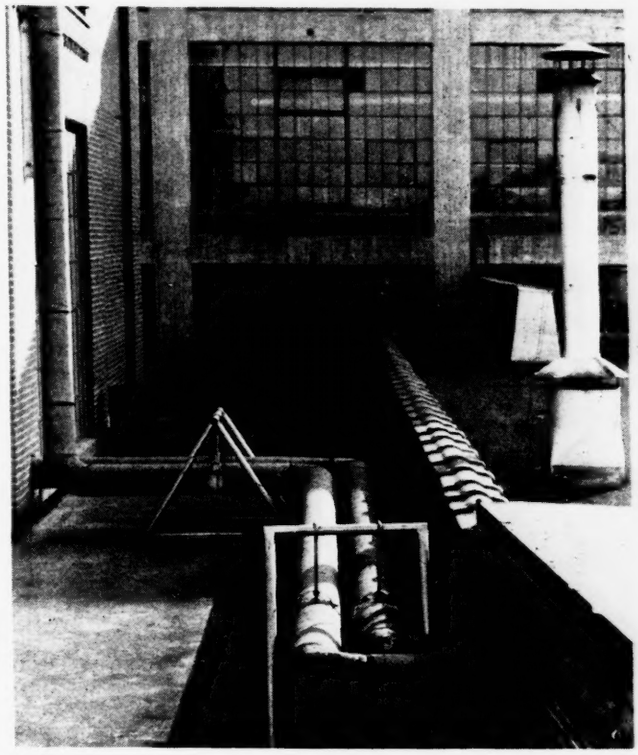
Three Supertherm centrifugal pumps, driven by G.E. motors, circulate the water at 350F throughout the plant from a common header.

"waterproof," and are required when the field work is done with water. Their curing demands higher temperatures than glue bonds, and, in this case, the air circulation must be carefully controlled to prevent dangerous accumulations of explosive gases.

All automatic controls are operated by air and regulate the damper adjustments, the heat supply, and the moisture content of the various zones.

When leaving the dryers the sand paper is ready for use and is wound in rolls. They can be shipped as such, or more often, are sent to other departments, where they are cut up to size, or formed into belts, cones, and a multitude of other shapes, thus concluding the production cycle.

It can be seen from the foregoing description that the heating installation is of great importance in the manufacture of coated abrasives. The drying of sand paper requires precise temperature control during the entire operation, as otherwise the quality of the goods is seriously impaired. For instance, overbaked resin coats are brittle and useless; careless drying of glue bonds produces bacterial action and, consequently, spoilage.



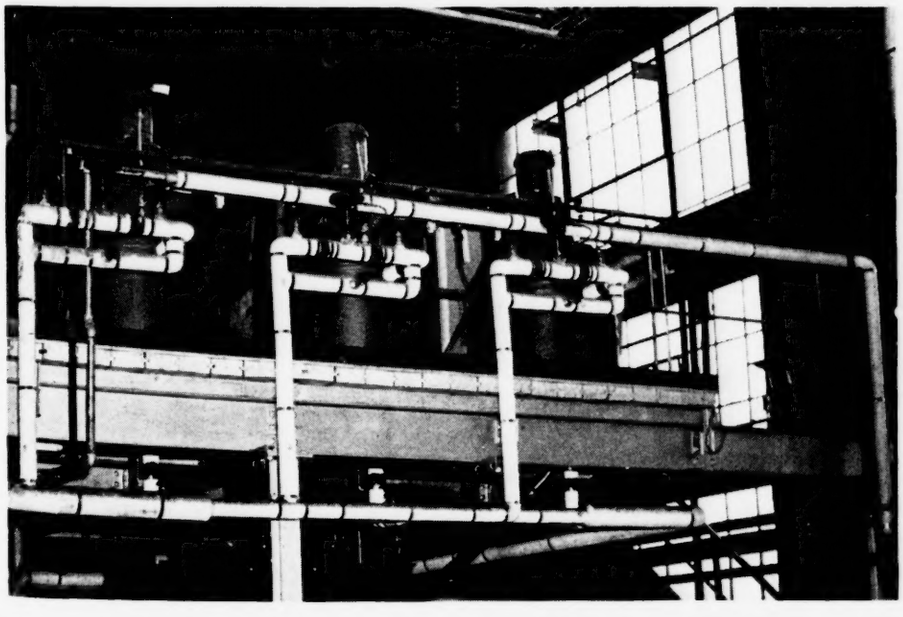
High pressure hot water mains between the boiler house and a manufacturing building. Note the pipe supports, permitting free thermal expansion. Insulation is waterproofed.

Heating Problem

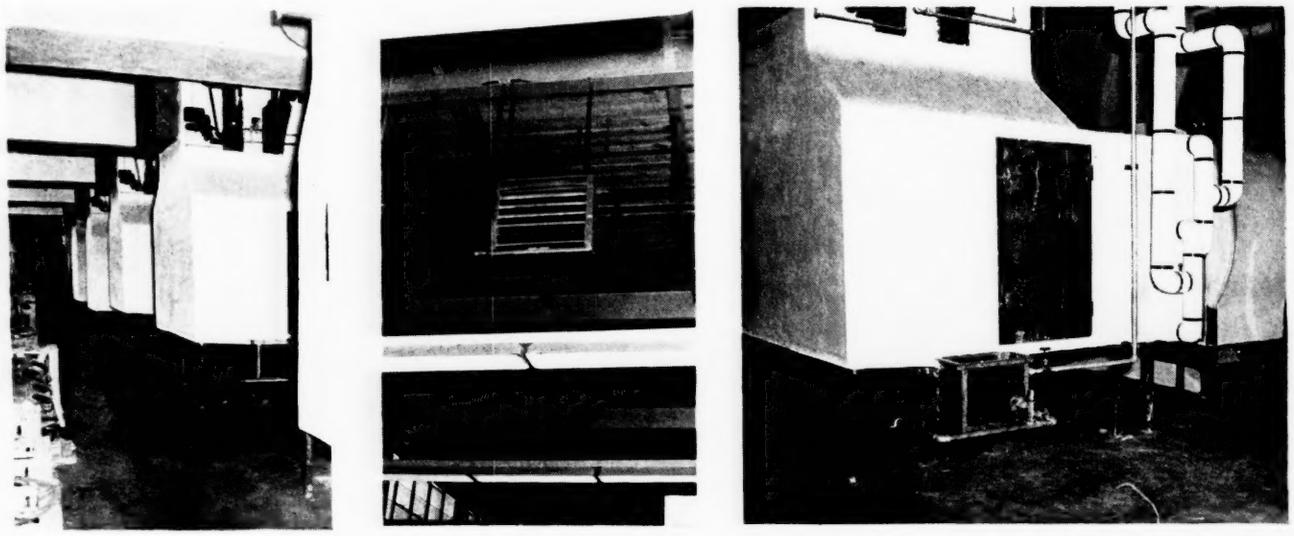
In 1939 the production of the Watervliet plant had reached a stage where the winter peak load required all of the four existing boilers to furnish steam, leaving no standby. At that time two new manufacturing buildings requiring heat were added at a considerable distance from the boiler house, and an increasing demand for phenolic bonds required higher baking temperatures.

The steam pressure was then 90 lb gauge, and to raise it to 150 lb meant also an increase in losses, since the condensate had to be pumped back from a number of vented collectors, distributed all over the plant. Flash losses of condensate increase with the operating steam pressure. They occur in steam systems with vented collectors or hot wells and are due to the liberation of that part of the condensate heat which is above 212F. Losses grow rapidly whenever traps, vents, separators or other accessories are leaking, or when the operators bypass such accessories.

Thus the added load from the new buildings, the prospective increase in heat losses, and the absence of a spare boiler left two alternatives: (1) Provide a fifth boiler, requiring a new boiler house, or, (2) eliminate the losses. It was concluded that the installation of a high pressure hot water heating system would be the logical approach to the second alternative, and a Supertherm system was selected.



Glue kettles with secondary water heating system, on mezzanine, are additional heat users. Automatic temperature control valves are clearly visible in each connection to heater jackets.



(Left) Centrally-located air conditioning units for the five zones of the festoon dryer. The Foxboro Vernier Valvator for damper control can be seen overhead, while slightly to the left is the air makeup inlet. (Center) Typical connection of high-pressure hot-water piping to Buffalo Forge unit heater in the spiral-binding department. Note insulated hot-water mains along monitor windows. (Right) Close up of dryer conditioning unit showing return duct, plenum chamber and suction duct to air circulating fan. Units, and high pressure water connections at right, are insulated by Ehret Magnesia.

The boiler plant consists of four 150 lb HRT Dillon boilers with a normal capacity of 270 boiler hp each, and able to operate at 150% rating and 76% efficiency. The boilers, which were originally oil-fired, have been converted to coal since the war, and are equipped with Strong-Scott pulverizers.

The particular boiler construction, as well as the fact that a high pressure boiler and a power generating unit may be installed in the future, made it desirable to separate the Supertherm system from the boilers. The accompanying drawing shows the schematic hookup of the boiler house. The boilers are connected to a steam header, which in turn feeds the remaining process mains, and, in particular, the hot water generator, where the water of the Supertherm system is heated to 360F, or within 3F of the saturation temperature of steam. Condensate from the hot water generator is returned directly to the boilers at high temperature, without any flash off or water loss. The regular boiler feed equipment is connected in parallel, and in such a way as to furnish make-up only, when the condensate return is not sufficient to satisfy the boiler demand. Such an arrangement is necessary because one department (15% of the heat users) continues to use steam. The condensate from this department is delivered to the hot well, where the boiler feed pump picks it up and returns it to the boilers.

The Supertherm equipment in the boiler house can take care of the maximum load of 41,000,000 Btu per hour. The high pressure hot water is circulated throughout the plant by means of specially-designed centrifugal pumps, withstanding 250 lb pressure and 400F. There are three pumps, each directly coupled to a 20 hp electric motor. One pump can carry the light summer load; in the winter two pumps are used, the third being a spare.

Since the hot water generator and the pumps are not located in the boiler house proper, but in a separate room next to it, a small signal board has been provided for the convenience of the operator. By watching the board he can see at once, and without leaving the boilers, how the heating system is functioning. Lights of different color give warning if the condensate return should not function properly, or if more make-up is required.

The Supertherm system serves many heat applications, including:

Festoon Dryers: Because of their great length and height, the previously described dryers require a well-designed air distribution system. The tunnels have panel enclosures, the internal insulation of which consists of either aluminum foil or mineral wool. The panels are fitted together by the tongue and groove method, thereby preventing any leakage. As previously mentioned, the oven design allows for the widest possible range of operating conditions. The recirculated air is mixed with the make-up air and passes over heating coils before being returned to the dryer. A central control board registers the various zone temperatures and the air humidity, and enables the operator to modify the air cycles by remote control. Automatic valves maintain a constant oven temperature by throttling the flow of the heat carrier. Where the makers are equipped with air washers, the circulated spray water is preheated to about 120F by means of a small heat exchanger.

Sand Curing: The electro-static coating method, in particular, operates satisfactorily only if the sand is free from moisture. The abrasives, therefore, are put on trucks and stored for hours or days in a hot room before they are delivered to the coating machine. The heating of this room is done by air recirculation over a suitable heating element. Provisions have been made for appropriate make-up and exhaust air.

Water Heater: One of the manufacturing depart-

ments requires a considerable amount of domestic warm water. This is heated by a removable tube bundle built into a 1000 gallon storage tank. An automatic valve prevents the overheating of the storage water by the Supertherm system.

Room Heating: Unit heaters are directly connected to the hot water system; the temperature control is obtained by thermostats which start and stop the fan motors.

Testing Laboratories: These rooms are air conditioned, since the ambient air must be kept under close and constant control. The heating elements of some of the air conditioning apparatus are quite small, requiring very little heat at times. Particular care was taken to select the right size and type of control valves, since a unit volume of hot water contains about fifty times as many Btu as steam at the same pressure.

Bonding Department: The glue is prepared in double-walled, heated kettles. Some of the cooking processes require exacting control at low temperatures. The glue becomes useless when over-cooked and may even burn if the walls are too hot. For this reason, secondary hot water circuits were installed, receiving their heat from the high pressure hot water mains directly, or indirectly by means of a heat exchanger. In either case, a small circulating pump assures a rapid water circulation and temperature limits of ± 1F can be maintained.

Piping

All of the many users described above function without traps, separators or pressure reducers. The distributing high pressure hot water mains consist of seamless steel piping, welded throughout. Particular attention was paid to the method of pipe suspension, assuring free thermal expansion and protecting the conduits from excessive stresses. Valves are of such design as to offer the least flow resistance, and have stainless steel trim. All valves are flanged except the small sizes which are screwed.

Since pipe radiation is mainly a function of temperature difference, the thickness of the insulation was chosen to be about the same as for a steam system. Molded magnesia sections, covered with a canvas jacket and banded together, give good results. Where the insulation is exposed to the outside, weatherproofing was applied.

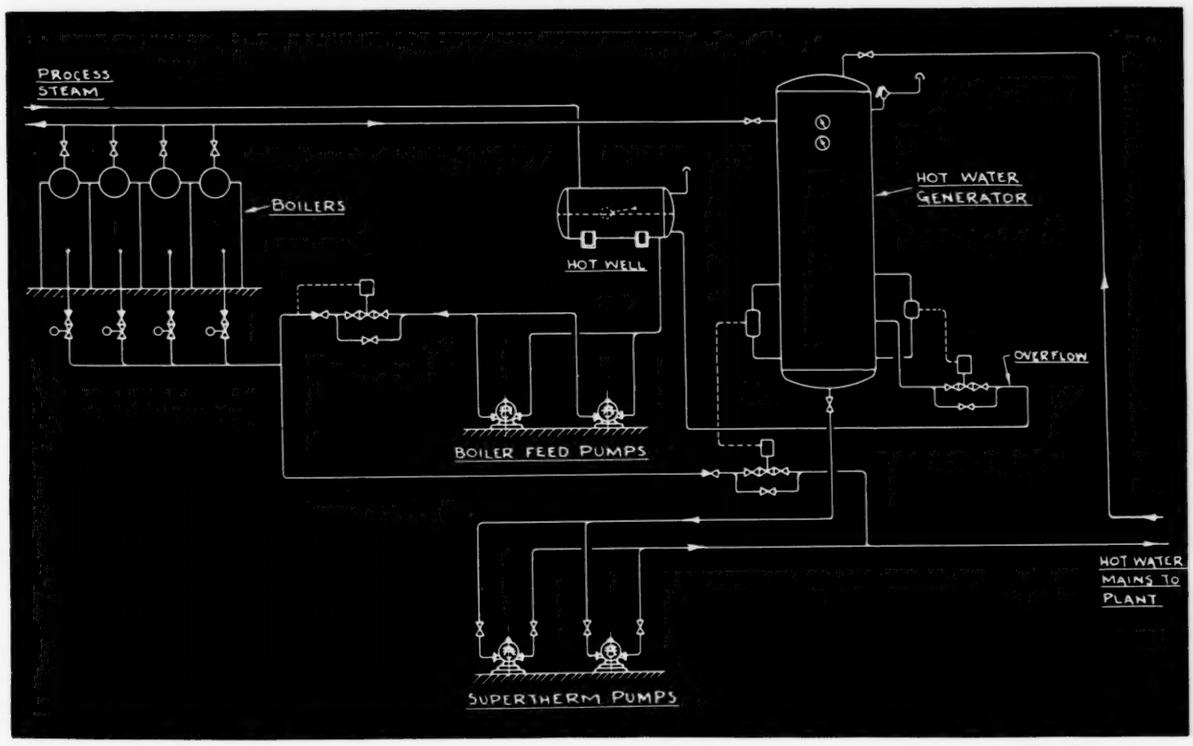
The heat medium, or carrier, of the Supertherm system consists of distilled water. To prevent internal pipe corrosion, a slightly alkaline pH value is maintained with good results.

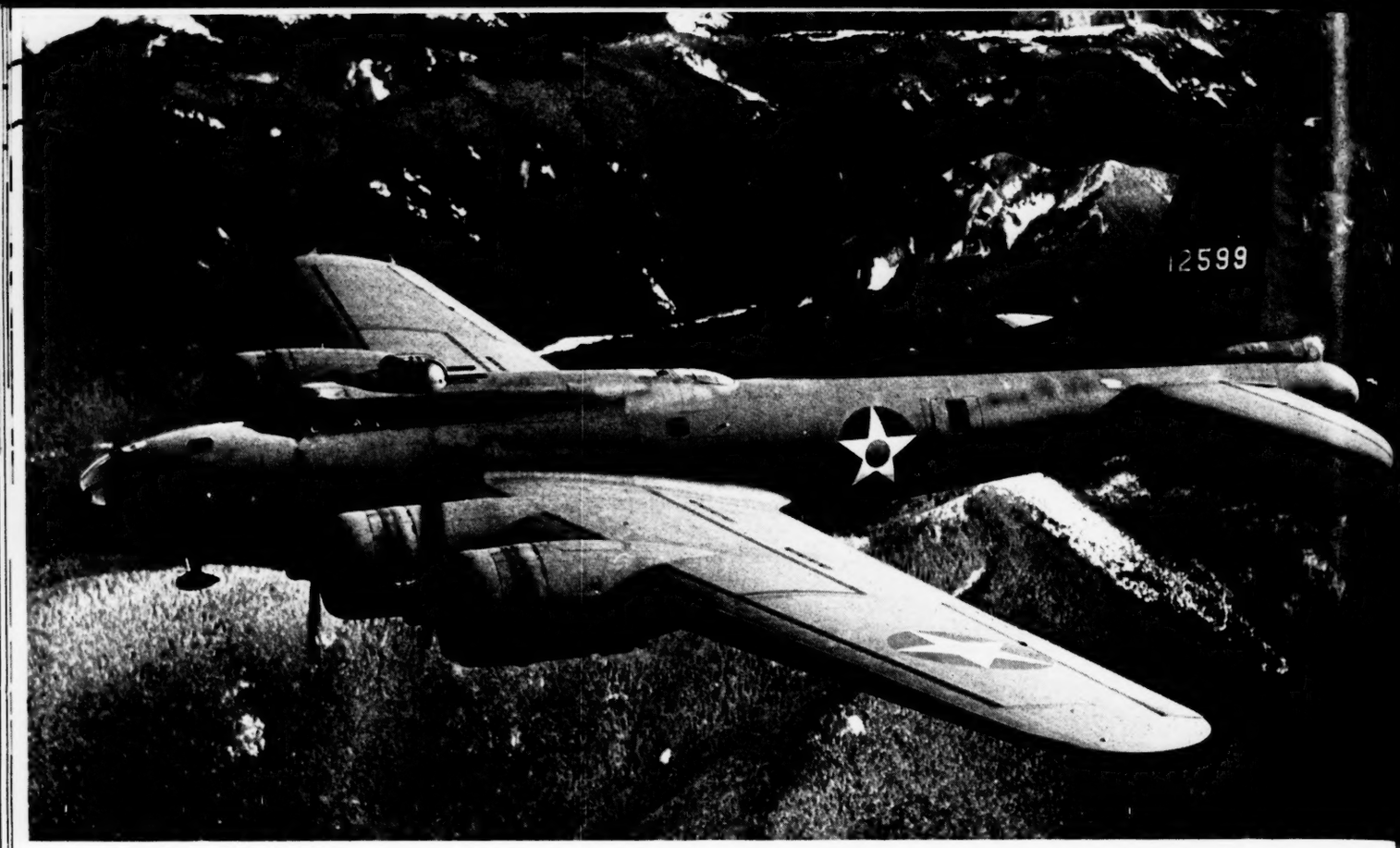
Since Pearl Harbor, the activities of Behr-Manning have widened and now include the production of war machinery, such as ignition parts for airplane motors and machine tools. Some of the dryers which can be spared from the sandpaper production, have been modified for the curing of insulated wires used in airplane motors. The yearly steam loads of the boiler house increased as shown in the following: 1939—104,330,788 lb.; 1940—127,128,328 lb.; and 1941—174,614,612 lb.

In spite of the rapidly mounting heat demand, the present boilers have been able to handle the winter load since the Supertherm system was installed.

The Supertherm system and festoon dryers were designed and installed by the J. O. Ross Engineering Corp. of New York.

Schematic drawing of Supertherm system piping and equipment in boiler house.





Kansas Bomber Plant

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has 13 air conditioning systems serving offices, engineering, laboratory and testing areas; exhaust systems for process spaces, and projection type unit heaters for heating main building.

A COMPLETELY integrated plant for the production and assembly of heavy bombers has been built in Kansas to match a similar project completed last year in the Northwest. Both plants were designed and constructed by The Austin Company.

The new plant is of steel frame construction with welded insulated roof deck, concrete floors, and sidewalls of brick below the first band of sash, and continuous bands of corrugated asbestos siding and sash in alternate arrangement above. It includes under one roof, the following:

Two material warehouses; basic primary shops where steel, stainless steel, aluminum, duralumin, and other kinds of sheet metal are fabricated, or otherwise prepared; machine shops; sub-assembly and final assembly areas; heat treating, plating, anodizing, parts painting, and die casting departments; inspection, testing, X-ray, and photographic laboratories; phototemplate department; first-aid rooms; a central plant dispensary; kitchen, with rolling food wagons delivering hot food three times a day throughout the plant; a cafeteria; underground access tunnels for employees leading direct from the entrance gates to stairs within 200 ft of all working locations in the main production area; basement lavatories, toilets, and cloakrooms; and boiler rooms.

This huge manufacturing building has an under-the-floor distribution system for all service facilities, carrying compressed air, power, and water lines to outlet boxes in all parts of the working area. Fluorescent lighting, supplemented by high intensity mercury lamps in the main assembly bays, provide 30 foot-candles of illumination in all working areas.

A three-story air-conditioned Administration Building accommodates a large engineering department; purchasing, accounting, and production personnel; general management; and resident Army Air Force representatives. This building has an exterior of red face brick with stone trim and panels

This article approved for publication by the War Department

of black structural glass between window areas to create the effect of continuous horizontal bands around the building. Fluorescent lighting recessed in acoustical ceilings give 50 foot-candles of illumination. The entire building is fitted with Venetian blinds.

The personnel building, also air-conditioned, has facilities for interviewing applicants for employment, making medical examinations, taking photographs, and has three conference rooms convertible into one seating 300 persons.

Other structures include a paint storage building; a plant protection headquarters, accommodating the staff of watchmen and containing the special telephone and signal system used in supervising the plant; specially-designed guard houses, mounted on concrete columns at strategic points around the site and equipped with special heat-resisting glass to facilitate observation of all activity; a bus loading station; material warehouses; and a salvage building, which is equipped to handle all scrap from the plant.

Heating and Ventilating

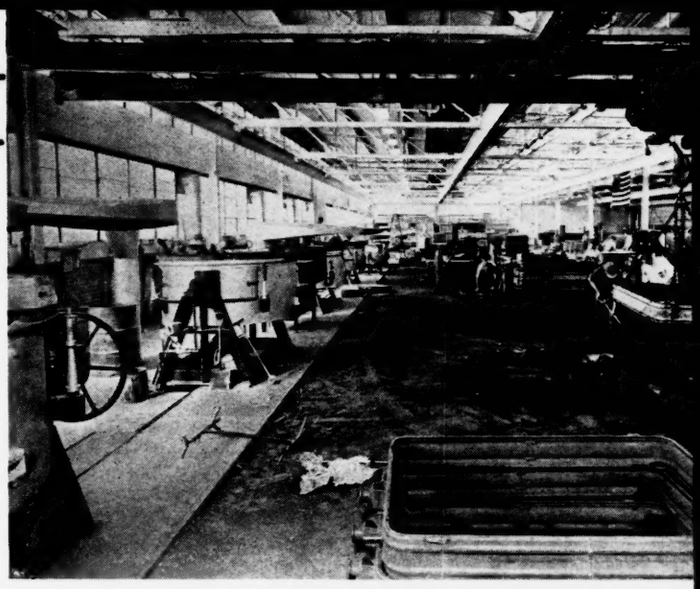
A number of 350-hp automatic gas fired boilers, divided between two interconnected boiler houses, serve the heating system in the new plant.

Steam risers alongside the building columns from underground trenches to points high above the floor are connected to projection type unit heaters which draw air over the finned circular heating coils and blow it down upon the working area. Each heater is automatically controlled and delivers warm air whenever necessary to maintain the proper factory temperature. The unusual height of this working area required heating units having a high discharge velocity in order to drive the heated air to the floor and diffuse it evenly. Each unit in the large open areas has a heating capacity of approximately 600,000 Btu per hr. The units are spaced 60 ft apart in such a way as to cover every part of the assembly floor, without any drafts or abrupt blasts of hot air.

Underneath the mezzanines covering a large part of the plant, provisions have been made to bring outside air in through a maze of ducts, an arrangement which provides circulation in summer and heated air under automatic control similar to the unit heaters in cold weather.

Hangar doors, 200 and 300 ft wide, extend across one end of the building. To offset the high heat loss at these points steam coils and fans are provided to build up a curtain of heated air at high velocity whenever the doors are opened in cold weather.

Provision has been made in the heating and ventilation to meet the requirements of health, comfort, and facilitating of processes in different parts of the plant where heat treating, plating, painting and die-casting are carried on. Heat and fumes produced in these operations are exhausted to the outside through close-fitting hoods, equipped with exhaust fans, while supply fans bring in outside air. In the die-foundry,



Dies used to form aircraft parts are cast in this foundry. The gas-fired Kirsite melting pots shown on the left are provided with ventilating hoods which exhaust fumes to the outside. The hoods swing clear of the pots when metal is being poured into the ladles which are conveyed to any position on the sand-covered foundry floor by the monorail, shown at right shaking out the sand around a newly-cast die.

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THIS PROJECT
designed and built by
The Austin Company

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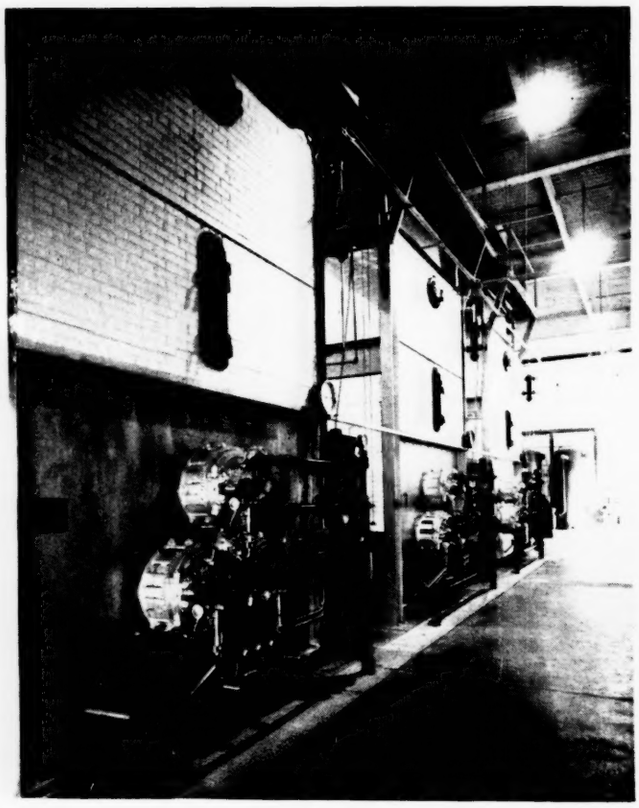
A portion of the engineering department on the third floor of the air-conditioned Administration Building. Air-conditioning ducts are concealed above the suspended acoustic ceiling.



The three-story air-conditioned Administration Building, part of the aircraft parts plant located on the plains of Kansas.

(Left) Three of the gas-fired boilers which provide steam for heating. The boilers are equipped with completely automatic controls. Checkered cast iron floor plate covers the underfloor trenches carrying gas lines to the boilers. Similiar trenches carry power, compressed air, water and gas to various portions of the plant, which has a minimum of overhead service lines. (Right) Underground corridors connect the entrances with individual departments and, in addition, carry water, steam and electric lines.

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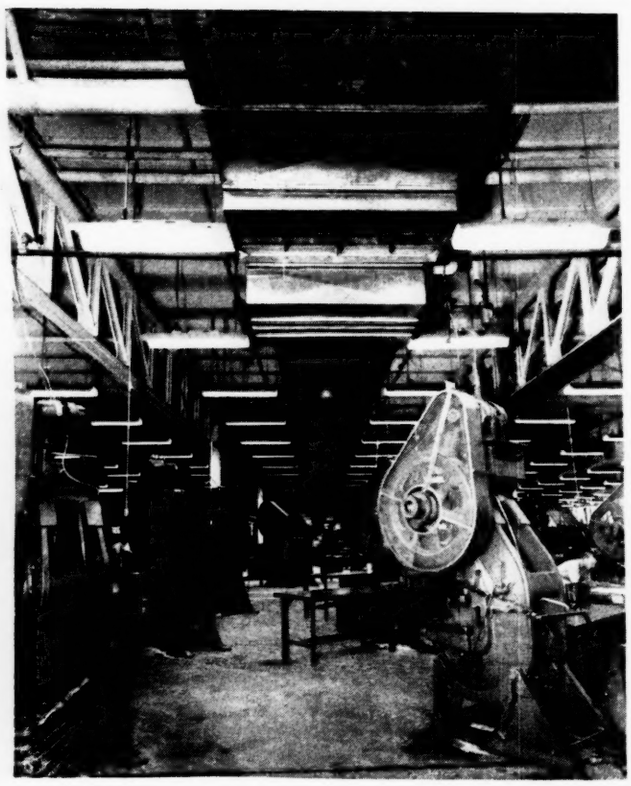
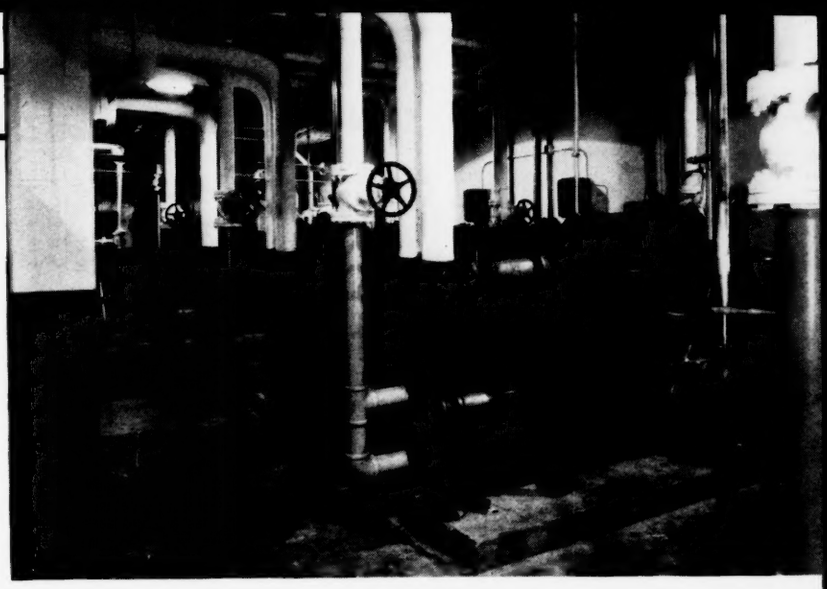
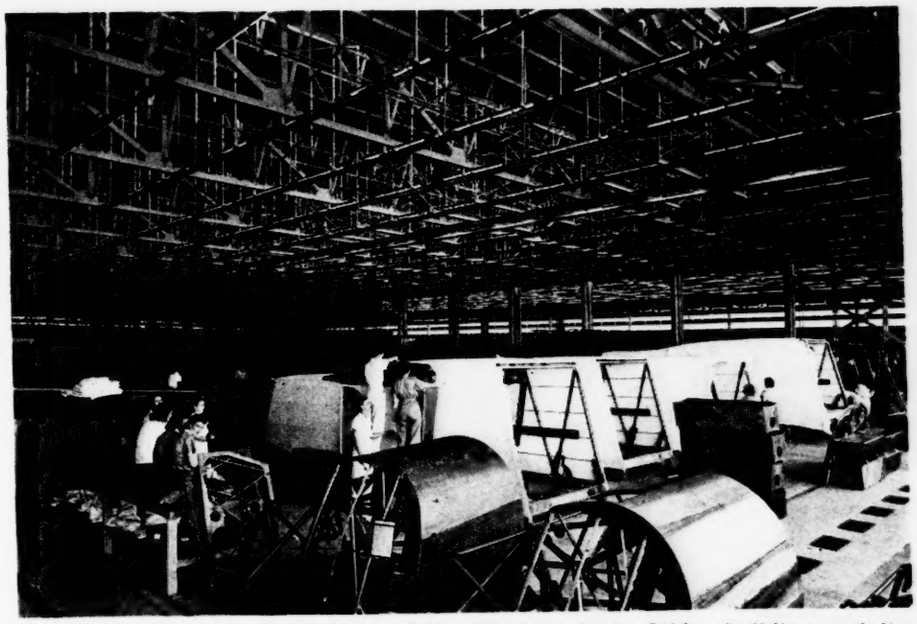
(Left, below) Heated outside air is supplied to this punch press department through the duct above the aisle. Air circulation and temperature is automatically controlled. (Right, upper) Part of the air conditioned office, showing ceiling outlets. (Right, below) Dies cast on the foundry floor in the left foreground of this area are cleaned, inspected and finished in this section where an exhaust ventilating system catches and removes metal particles from the air.



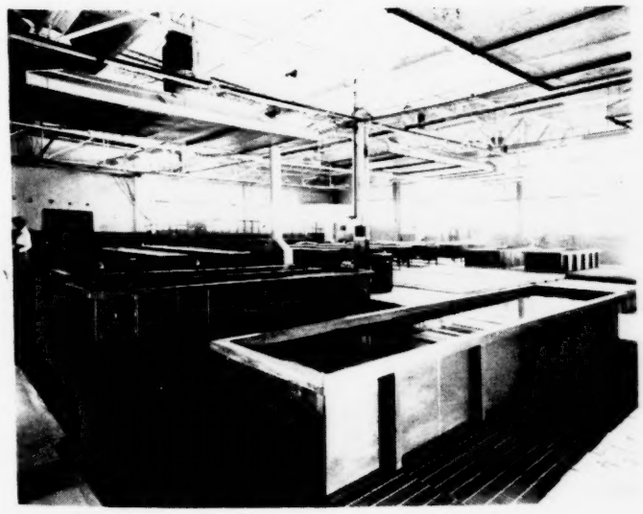


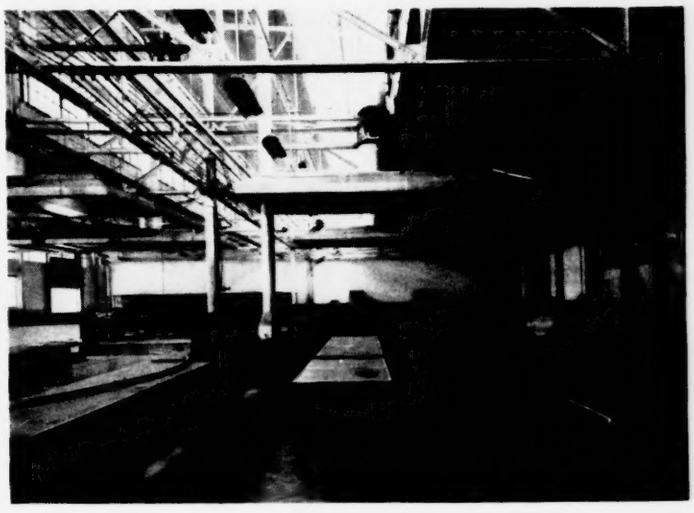
Some of the refrigerating compressors serving the office air-conditioning system. This system, with a refrigerating capacity of 400 tons, is one of seven independent systems installed at the plant.

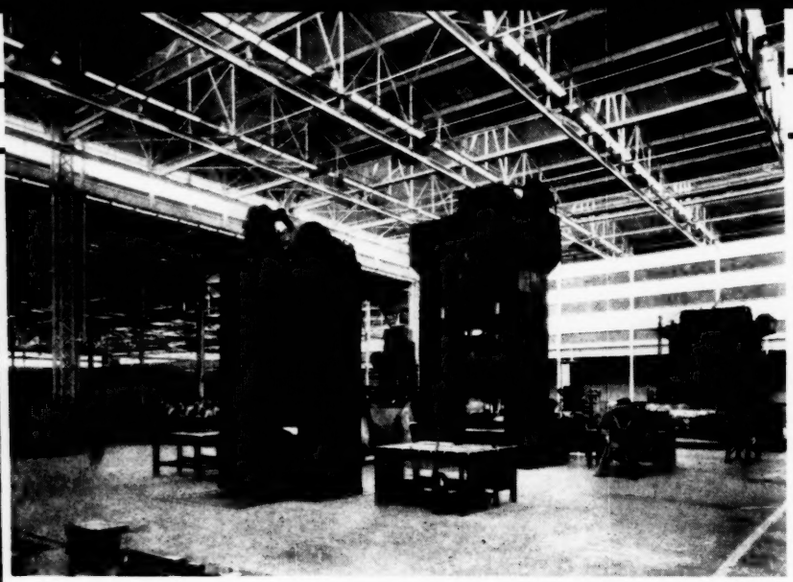


Looking across one of the bays of the Kansas plant. Glider building activity is shown here just inside one of the large hangar doors where heated air from the outlets shown in the floor at the right is blown upward to form a curtain in cold weather.

(Left, below) Section of the heat-treating department, showing the exhaust hoods and the floor grilles. (Right, below) Exhaust ventilation is provided in the heat treating department as shown here. Hoods are already in place for future tanks.







The unit heaters are shown high above the floor in the hydraulic press department. The presses are installed on isolated foundations.

for instance, exhaust stacks line the two sides of the room, one to remove heat and fumes from the modern gas fired pots where the metal for dies is melted, and the other to remove from the air metal particles from the grinding of the dies.

The largest ventilation system in these special departments is in connection with one large paint shop. This system covers two of the shop's four sides, with 150-ft wide outside air intake on one wall and an exhaust system of equal size on the second. Water sprays in the exhaust system wash the paint from the air before it reaches the outside.

The tunnel system provided to handle traffic of workers to and from their job locations in the plant has a heating and ventilating system using outside air. Fans draw the air off through transformer vaults and exhaust it through basement toilet rooms to the outside.

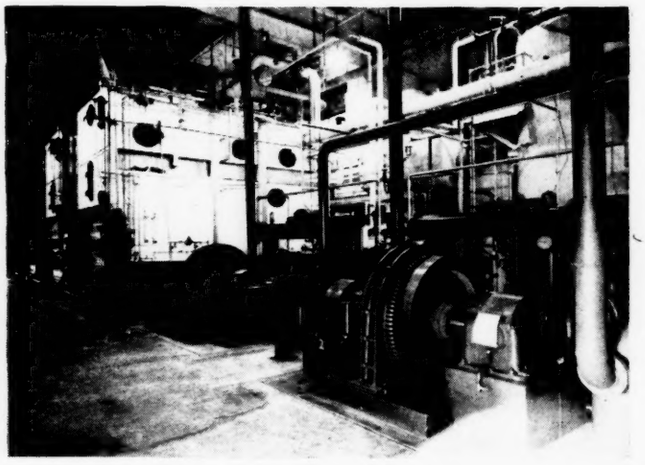
In addition to the multitude of heating and ventilating systems, there are thirteen separate air-conditioning systems in the new plant and offices, with several thousand tons of mechanical refrigeration. The largest of these systems serve the three-story office and engineering building, while separate units have been installed for the cafeteria and in the personnel building, in photographic, inspection and testing laboratories and in six first-aid rooms.

The general heating and ventilating systems and air-conditioning installations were designed by engineers of The Austin Company, and installed by subcontractors. These include general plumbing and heating facilities by the Ripstra Company; ductwork and mechanical ventilation by Turner Sheet Metal Works; air-conditioning systems by the Natkin Company and the Keener Air-Conditioning Corporation; paint shop system by the Binks Manufacturing Company; and gas burning equipment by the Midwest Heat Service Company. A partial list of equipment suppliers follows.

Equipment Suppliers

Paint Shop Air Washing and Ventilating Equipment	Binks Mfg. Co.
Louvers	Barber-Colman Co.
Steam Meters	Bailey Meter Co.
Boilers	Babcock & Wilcox Co.
Air Filters	American Air Filter Co., Inc.
Heating and Ventilating Vents	American Blower Corp.
Pipe and floor flanges	Crane Co.
Controls	Johnson Service Co.
Hot water heaters	Patterson-Kelley Co., Inc.
Gas burners	Todd Combustion Equipment, Inc.
Control panels	Square "D" Co.
Unit heaters	The Trane Company
Unit heaters	Carrier Corp.

(Left, below) Pumps shown at the right circulate water to the chilled water storage tanks (left) in this air-conditioning machine room. (Right, below) View in the boiler house showing some of the 350 hp boilers and the air compressors.



Allied Plastics Company

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manufactures plastic lenses for gas masks in room kept free from dust; plastic dried in infra-red ovens, stored in high temperature rooms.

IN converting its Southern California plant from peace-time production of miscellaneous plastic articles to the production of plastic lenses for gas masks, the Allied Plastics Co., of Los Angeles, was confronted with a special air cleaning and room preheating problem in order to produce lenses which would meet the rigid CWS (Chemical Warfare Service) specifications.

After considerable research and experimentation to find the most suitable plastic compound, an activity which included work on acrylics as well as other materials, a cellulose compound (Lumarith No. 10) was ultimately settled upon as the most desirable, and it is this material which is now demanded in CWS specifications for lenses. The compound is made according to the company's own formula by chemical manufacturers.

In the process of converting its plant to the manufacture of plastic lenses from cellulose acetate, Allied Plastics Co. found it advisable to design and construct its own heating cylinders, rams and other units for the large injection machines used in the process. These machines literally squirt the plastic compound, made molten by special heating devices installed on the heating cylinders of the presses, into molds which form the lenses.

Need for Clean Air

An air control problem of somewhat unusual scope arose from the fact that the company's plant is situated in a district of Los Angeles in which are operated a number of sash-and-door and other woodworking plants. Because of the proximity of these woodworking plants to the plastic factory, the air in the district contains more than the usual amount of dust, particularly sawdust. If this dust should settle on the lense molds between impressions, imperfections would be produced in the finished lenses which would bring rejections by government inspectors stationed in the plant. For that reason, clean air in the mold room became imperative.

This air is cleaned and handled by two 10,000 cfm blowers which furnish a complete change of air every minute in the 40 by 50 ft molding room and also create a positive pressure within the room, this pres-

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sure causing an outflow of air at all openings and eliminating the possibility of dust particles entering from adjoining rooms and contaminating the plastic material and the finished lenses.

Storage Room Control

The cellulose acetate (Lumarith) is delivered by the chemical manufacturer to the Allied Plastics Co. plant and stored in 250-lb drums in a storage room. Temperature in this room is maintained at 120 to 130F by thermostatic control. Regulated temperature is necessary to keep the powdered Lumarith free from moisture. Unit gas heaters are used for heating the room.

From the storage room the powdered Lumarith compound is moved, as needed, into an adjoining oven room. There it is placed in shallow revolving pans in two infra-red drying ovens, each 5 ft wide, 6 ft high and 20 ft long. Exhaust stacks from the tops of these dryers pass through the ceiling. Four waist-high doors give access to the interior of each oven, where the plastic powder is slowly revolved in shallow round pans 4 ft in diameter under a battery of infra-red lamps suspended from the ceiling of the oven, 15 in. above the pans. Metal fingers protruding from a cross-bar extending across the pan keep the compound stirred so that the entire mass can receive uniformly the infra-red radiation.

The purpose of the oven treatment is to remove all traces of moisture from the Lumarith. Actual oven air temperatures are kept between 135 and 140F, and the infra-red radiation gives a material drying temperature of about 150F. The drying time in the oven varies from 15 min to 2 hr, depending upon the amount of moisture to be removed. Each oven is equipped with four pans, and each pan has an average capacity of 30 lb of Lumarith per hr.

The firm has found that much of the credit for producing clarity in gas mask lenses sufficient to meet CWS specifications must be attributed to the infra-red drying process.

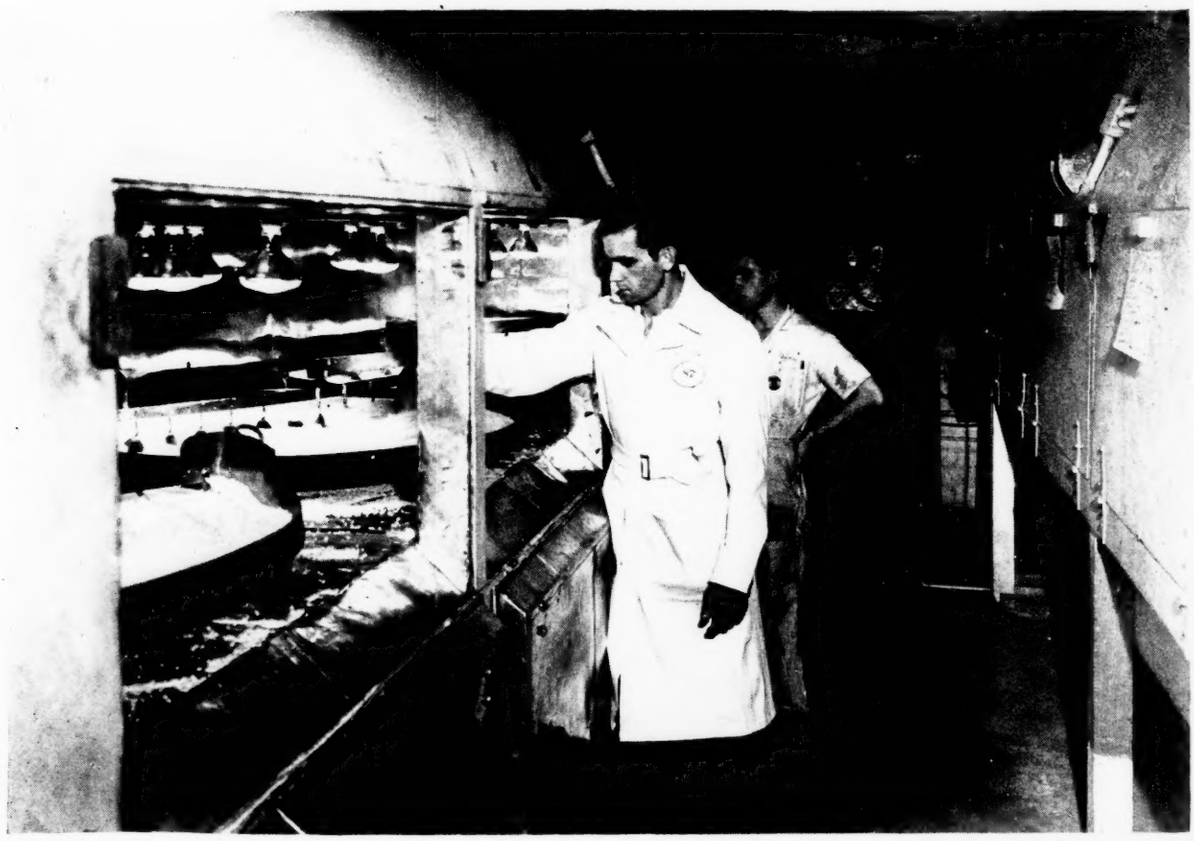
After this drying operation, the Lumarith is packed in 30-lb tin canisters and placed on shelves in a dry room. This compact chamber, size 5 by 25 ft, is held continuously at 100F, heated by gas-fired unit heaters.

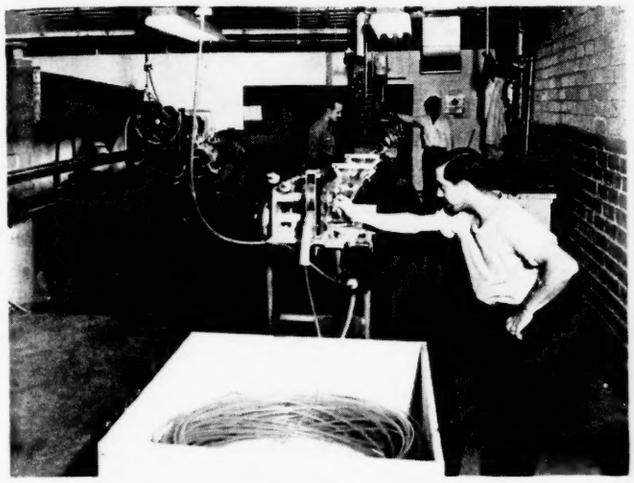
Air-Controlled Mold Room

Supplies of the plastic compound are removed from the dry room and taken, as required, to the mold room. This room is equipped with seven injector mold machines which form the lenses, five of which are Watson-Stillman, one an H.P.M. and one a Lester Phoenix.

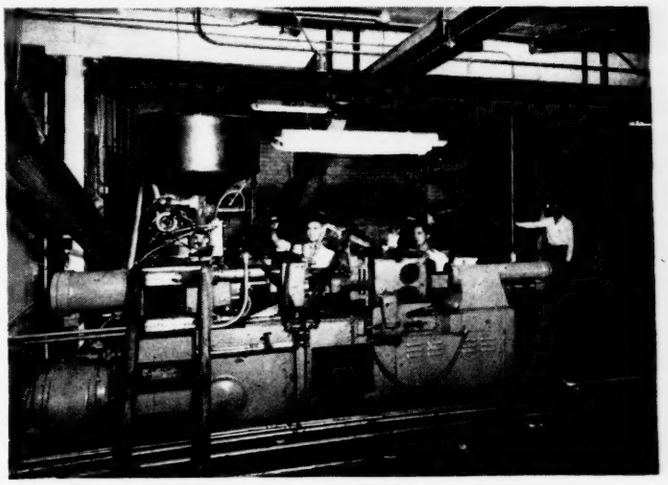
The dry Lumarith is placed in a hopper of 50-lb capacity, with which each of the injection presses is equipped, and from there passes directly down into a heating chamber. Oil-burning heating units, in-

View of one of the drying ovens where the powdered cellulose acetate, or Lumarith, is dried under infra-red radiant heat lamps. The pans slowly revolve, and stationary rakes stir the material and keep it uniformly exposed to the radiation, insuring complete removal of the water content. Ovens are kept between 135 and 140F, while the material drying temperature averages about 150F, due to the absorption of radiant heat.





Plastic tubing in the form of a hard, finished, amber-colored tube is seen emerging from the automatic coiling device in the foreground. The air duct (background, above machine) is part of a comfort air conditioning installation, consisting of multiblade blowers and a 3500 cfm Dezert Kooler evaporator, the latter installed on the roof.



View of the mold room, showing one of the injection presses used to form gas-mask lenses from plastic material. Air control is maintained in this room to keep the air free from dust that might settle upon the molds. Two 10,000 cfm blowers, supplied by General Air Conditioning Co., provide one air change per minute.

stalled on injection cylinders, heat the cellulose acetate to a molten state at temperatures of 420 to 500F. From the heating cylinder an injection ram, which is set for a definite rate of feed, pushes a specified amount of the now molten plastic compound into a five-cavity lens model.

The lenses emerge from the mold in groups of five, shaped somewhat like five-leaf clovers. The mold opens automatically at half-minute intervals to permit the operator to lift out the hot molding for inspection. A cutting machine equipped with a heated, air-operated knife is used to separate the connected lenses and to snip off sprues, gates and runners.

Air Conditioned Departments

The inspection, packing, shipping rooms, offices, and other departments not subject to special heating or air control, are heated by steam radiators from a central boiler plant. These departments also are equipped with a general blower system for comfort air conditioning. Multiblade squirrel-cage blowers and a 3500 cfm Dezert Kooler evaporator are used for that purpose. Blowers and evaporator are installed on the roof, installation having been made by the General Air Conditioning Co., of Los Angeles.

Steam for Plastic Tubing

An individual boiler, which is installed in a penthouse on the roof of the factory, supplies heat to a machine employed in the manufacture of plastic tubing which is finding use as a substitute for copper tubing. A plastic powder compound known as Saran is used in the manufacture of plastic tubing. The Saran is placed in the hopper of an extruding machine and passes into and through a steam heating chamber where it is reduced to a pliable and moldable state. Steam for this purpose is supplied by a 10 hp Thompson boiler installed on the roof of the factory.

From the heating chamber the compound moves through a worm die and emerges in the form of a continuous tube, amber-colored and soft. As the tube moves slowly down a V-shaped trough filled with water heated by steam to 122F, air from a compressor is shot into the soft plastic tube to prevent it from collapsing before the cooling effect of the water has hardened it. The plastic tube emerges from the worm-die end of the extruding machine at 310F. After passing through the 15 ft long trough of water the tube's temperature has been reduced to about 80F, at which temperature the now fairly hardened tube reaches rollers which push it through a counting device and automatic coiling mechanism.

Scrap Plastic

Scrap from the molding of gas-mask lenses is reused for various other wartime articles and non-defense items, but not for lenses since CWS specifications permit the use of only fresh, clean compound for gas mask lenses. One such use for this scrap is in the manufacture of cone-shaped plastic holders for packaging the spiral springs of incendiary bombs. The delicacy of construction of these springs formerly posed a considerable packaging problem because there was a tendency for the springs to tangle if packed in bulk. Use of the holders, it is claimed, has resulted in efficient shipment of the springs to bomb assembly plants.

The Allied Plastics Co. manufactures the spring holders in an injection press similar to the presses used for lens making, but at a rate of 48 at one operation of the press.

Non-defense articles which this company still makes from cellulose acetate and from lens scrap include plastic floats as substitutes for copper toilet floats, safety-goggle lenses for industrial workers, and plastic tooth brushes, cigarette cases and hair curlers.

United States Navy

THE new Materials Testing Laboratory, located in an Eastern Navy Yard, is a purely functional structure. The building was designed to assemble under one roof, and to contain, the most modern testing and research equipment and processes known. These will be applied to all the varied equipment and services which form a part of the new warships our Navy is now building. Upon conclusion of the present war, the equipment installed will be used in testing and developing newer materials and in determining whether manufactured equipment meets the Navy's rigid specifications.

Provision for the many mechanical and electrical services, and special structural features necessary, was alone a mammoth task, requiring the closest cooperation and understanding between the Navy Department's laboratory and research staffs, their operating and production engineers, and the designing architects and engineers.

The new building is a six story structure with basement and two mezzanines and contains 262,000 sq ft of floor space and a volume of 37,160,000 cu ft, with provision for a future floor.

Heating

Steam supply at 165 lb and at 10 lb pressure is brought to a steam room in the building in underground conduit from the central boiler plant serving the Yard. The 10 lb low pressure steam varies in pressure and quantity, depending on operations at the boiler plant. It is used exclusively for heating the building, for domestic and process hot water heating and for process steam supply to the Chemical Laboratories. Whenever the capacity or pressure of the 10 lb main is insufficient for the demand, steam make-up is automatically supplied from the 165 lb main through a pair of pressure reducing valves. One valve is sized for the summer load and the other for the difference between the summer and winter loads. The valves are cut into service at 6 and 7 lb pressure, respectively. As soon as the pressure in the 10 lb low pressure main rises one pound higher than the maintained pressure in the low pressure header, the 165 lb make-up is cut out, and steam is admitted to the header from the 10 lb main through a balanced stop and check valve. Process steam supply is taken directly from the 165 lb main and reduced as required.

Returns from the water tank heater at the roof, the hot water heaters, the heating coils for air conditioning and ventilating systems, and all process returns are run to a duplex condensation pump. High and low pressure drips in the Steam Room are also discharged to the condensation pump, but through a flash tank. A duplex vacuum pump is used exclusively for building heating returns, in connection with automatic zone control.

The entire building, including the air conditioned areas, is heated by means of enclosed cast iron convector radiators, except the mezzanine at the 6th floor, where unit heaters are used.

The heating system is low pressure, two-pipe, vacuum return, designed to maintain 70F in all areas except the air conditioned spaces where wall losses alone were considered. Properly to blanket the large window area, each bay has two convectors piped in tandem from up-feed risers at the columns.

Individual radiators have orifices in the steam supply connection for proportioning the flow according to the size of the radiator. The piping is arranged for zoning all radiators according to exposure, and a total of four zones is provided for North, East, South and West exposure. Automatic throttling-type valves are electrically operated and are installed in each of the four zone steam supply mains. Each zone is individually controlled from an outdoor thermostat which varies the steam flow in accordance with changes in outdoor temperature, and may be manually adjusted for quick heating-up, or for any other condition. A panel is located in the Steam Room and all controls are centralized at this point. The zone valves, radiator valves and traps, orifices, drip traps and the duplex vacuum pump and controls were pro-

This article approved for publication by the Navy Department

Materials Testing Laboratory

at an Eastern Navy Yard contains what are probably the most comprehensive and diversified applications of air conditioning, ventilating and heating ever installed in one building, for testing Navy instruments, phenolics, cable, rubber, batteries, and other materials under service conditions. Includes 160F Hot Room, —40F Cold Room, ventilation for chemical and electrical rooms, vacuum heating with orificed radiators.

By FREDERICK J. RICE

Mechanical Engineer, Lockwood Greene Engineers, Inc.

vided by a single manufacturer, in order to secure a standard, uniform and proven system of automatic control. All unit heaters are controlled by individual room thermostats, with hand-off-automatic switches.

Air Conditioning

A central refrigerating plant of 300 tons capacity provides 550 gpm of chilled water at 45F for the air conditioning systems throughout the building. The chilled water is circulated from a central point in the basement to supply risers in pipe shafts at the North and South ends of the building.

Fan rooms are located at the pipe shafts to minimize the length of branch piping required. The shafts also serve as relief ducts, exhausting the normal and maximum outdoor air quantities for the fan systems, above the roof.

After the chilled water circulates through dehumidifying coils in the air conditioning systems, it flows up to a vented balance tank above the top floor, from which it is returned to the plant in the basement.

Seven hundred and sixty gallons per minute of condensing water is circulated through an induced draft cooling tower on the roof and serves the central refrigerating plant, as well as several individual plants which operate at lower refrigerant temperatures than the central plant. The chilled water and condensing water circuits are shown on the piping diagram on page 58.

Two 8-cylinder reciprocating compressors, direct connected to 150 hp motors, operate on Freon 12 and provide refrigerating capacity for present requirements. The compressors are equipped with automatic capacity reduction control of 25% and 50%. There is space for a future compressor, and the chilled water lines are now sized for this increase in capacity. A shell and tube condenser and water cooler, together with Freon receiver, are mounted above the compressors, and space has been provided for future units.

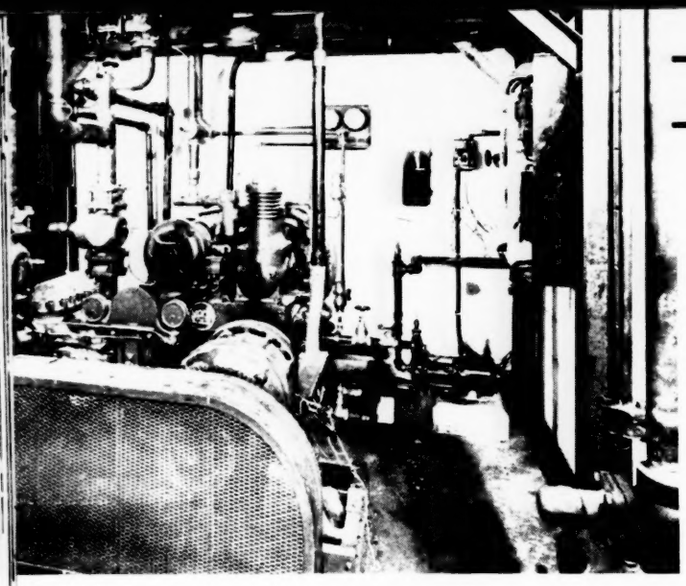
All air conditioning systems are designed to operate with the refrigerating plant shut down in winter, when cooling requirements may be met by the introduction of outdoor air in any quantity up to 100% of system capacity. Refrigerant piping and all chilled water and condensing water piping are standard steel, welded.

Navigational Division—Year-round control of temperature and humidity, together with dust-free air was the requirement of the Navigational Division. Conditions in the main testing room must be held at 80F dry bulb and 50% relative humidity in the summer and 74F D.B. and 50% R.H. in the winter.

Spaces include rooms that are wholly interior and others that have outdoor exposure, and the air conditioning layout selected assumed the form of two central station systems, one supplying the interior rooms and one supplying the exterior rooms. This selection also permitted one system to be shut down when it was not required, according to operations within the Division.

Air quantities for each system were determined for the winter operating condition, when outdoor air is used for cooling, and on the basis of a 20F differential. In summer, this method results in a lack of sensible cooling capacity available in the air supplied.

The six-story Navy Materials Testing Laboratory which has a wide variety of air conditioned rooms for testing naval equipment under operating conditions.



Compressors for the —40F cold room.

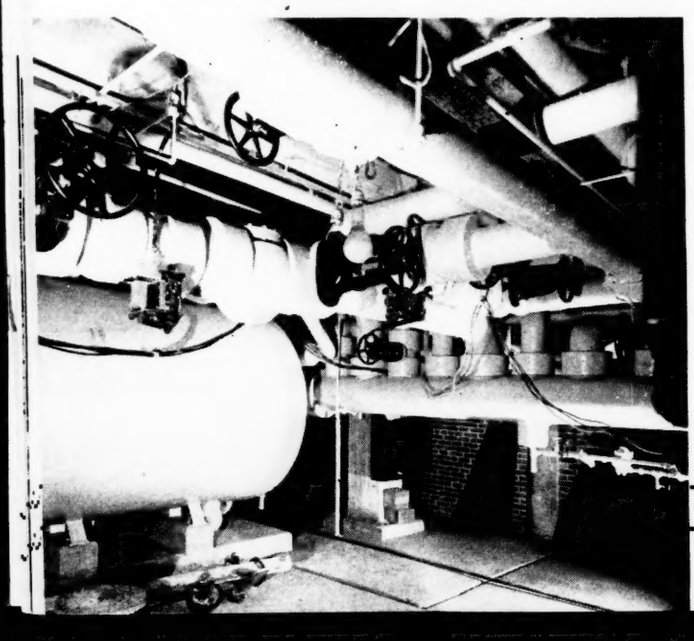
To provide for this condition, a total of nine recirculating unit coolers, operating on chilled water and similar in construction to horizontal type unit heaters, were located in the rooms, adjacent to equipment having high sensible heat losses. The units are controlled by individual thermostats so that any localized sensible heat concentration will be absorbed immediately. This method of cooling was also desirable from the standpoint of equipment operation, which is variable.

The length of the area conditioned varies from 100 to 180 ft with ceiling heights between 10 and 22 ft. Return air fans were used in order to provide positive air circulation for this extensive area, and to eliminate relief openings close to the ground level.

The Division comprises 11,220 sq ft and 193,000 cu ft. The two supply systems circulate 26,350 cfm and 9,200 cfm with equal quantities handled by the return air fans. The total refrigerating tonnage required under maximum conditions is 113.2, provided by 216 gpm of 45F water for the central systems, and 63 gpm for the unit coolers.

Supply air is introduced through an overhead duct distribution system, employing ceiling type outlets. Return and relief air is removed near the ceiling and the floor through a duct system run below the floor and in the basement.

The steam room in basement showing hot water tanks and piping. Steam is brought to this room in underground conduit from the central plant.



THIS PROJECT

Designed by

Lockwood Greene Engineers, Inc.

A constant minimum quantity of outdoor air is introduced into the area at all times by the two fan systems. In summer, a precooling water coil cools and dehumidifies this air to the room dewpoint, and in winter a preheating steam coil heats the air to the dry bulb temperature corresponding to the dewpoint. Outdoor and return air is then filtered, and in summer it is further cooled in a bank of three water coils, each under control of a three-way valve. Control is stepped so that two coils become inoperative in sequence on a demand for less cooling, while the third coil remains in operation under dewpoint control. All dry bulb controls on the cooling cycle take precedence except when return air hygrostats overcall their settings. When this occurs, 25% air volume reduction control and steam reheating are placed in operation, in sequence, to maintain the room dry bulb condition. In winter, with the chilled water system shut down, conditions are maintained by mixing dampers, proportioning outdoor and recirculated air.

No. 10 Testing Room.—A separate insulated room, adjacent to the main Testing Room, is used in conducting additional tests. Here unusual atmospheric conditions are simulated by means of a complete individual air conditioning system consisting of a Freon compressor with water cooled condenser and standby, horizontal ceiling type air conditioning unit, containing filters, heating and cooling coils, recirculating sprays, spray water heater, a city water cooling coil, spray heads located in the room, and automatic controls.

Conditions to be maintained are variable, ranging from + 32F to 130F and with corresponding relative humidity between 50 and 90%. For any room condition selected, the temperature and relative humidity must be uniformly maintained for several days at a time.

In designing the system for the multiplicity of conditions required, several interesting points were encountered, as: it was found necessary to provide a slight amount of cooling effect while maintaining the room at 95F or above, and a coil using city water as the cooling medium was selected for this purpose; it was necessary automatically to shut down and drain the steam coil and spray equipment in the unit when maintaining a room condition of + 32F, because of the danger of freezing; for maintaining relative humidity, spray heads were required in the room in addition to those in the unit because under some conditions, it was necessary to utilize the heat generated in the room for evaporating spray water.

Instruments and Phenolics.—For the Instruments and Phenolics Department, the required year round conditions are 77F dry bulb and 45% relative hu-

midity. Electrical instruments are calibrated and adjusted here in an area comprising 3,000 sq ft of floor space.

A central station air conditioning system supplies 5,600 cfm to the area, and in summer requires 35 gpm of chilled water with a refrigerating effect of 16 tons. In winter, up to 100% outdoor air may be drawn from the roof level through a duct riser, for cooling purposes, and air is exhausted from the conditioned space into a masonry relief shaft terminating above the roof.

Electric strip heaters are installed inside the double sash and are automatically controlled to prevent condensation. Electrical wiring for the heaters is series connected, which reduces the surface temperature of the heaters and will prevent cracking of the window glass.

Metallurgical and Welding.—In the Metallurgical and Welding Department 1,100 sq ft of floor space is used for exacting inspection of metals in the X-Ray, Printing and Dark Rooms.

Complete air conditioning is provided, and room conditions of 74F dry bulb and 50% relative humidity are maintained the year-round in these interior rooms.

A central station air conditioning system is employed for obtaining the conditions mentioned, and each room is provided with automatic volume control of the supply air under individual thermostatic control. In summer, 20 gpm of chilled water is used to produce the required refrigerating effect of 10 tons. At all times 3,900 cfm is circulated and up to 100% outdoor air may be introduced into the area for cooling purposes in winter. Relief air is discharged into masonry shaft and exhausted above the roof.

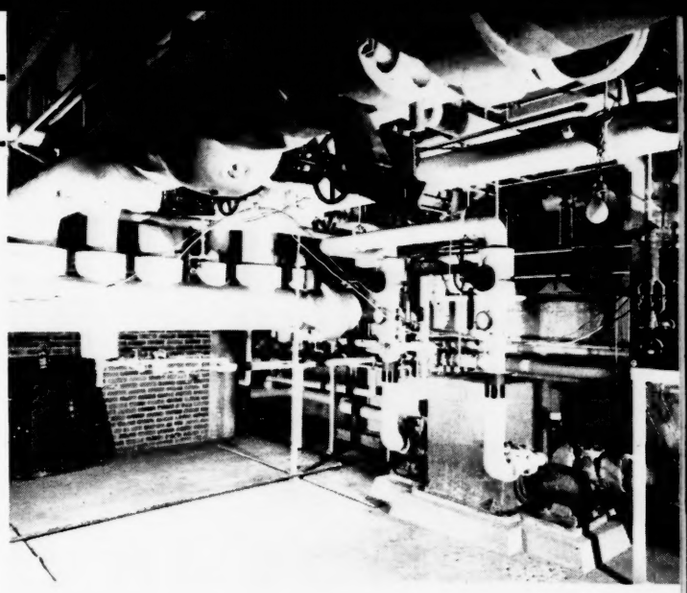
Cable Testing Department.—The Cable Testing Department includes several laboratories for testing various types of insulating materials used for electrical cables.

The room conditions of 68F dry bulb and 45% relative humidity desired required a lower chilled water temperature than was necessary for the remainder of the building. Rather than design the central refrigerating plant on the basis of a low and uneconomical chilled water temperature, it was decided to install a separate water chilling plant for this area, operating at a water temperature of 39F.

A water chilling plant of standard unit type assembly was selected at maximum capacity, to supply 55 gpm to an after-cooling coil in the air conditioning system. The remainder of the cooling load was then absorbed in a precooling coil using 22 gpm of chilled water from the central refrigerating system. The combined cooling load amounts to 25 tons of refrigeration and 7,100 cfm of conditioned air is circulated by a central station air conditioning system.

Condensing water for the separate water chilling plant is circulated through the cooling tower and a city water by-pass is provided.

The 2,100 sq ft of conditioned space is divided into three areas, which requires separate zoning in the



Pump room in basement showing instrument board and water piping. Building is heated by a vacuum system.

form of heaters and air volume control, because of exposure and operations within the areas.

Electric strip heaters are installed inside the double sash in the same manner as described for those in the Instruments and Phenolics Department.

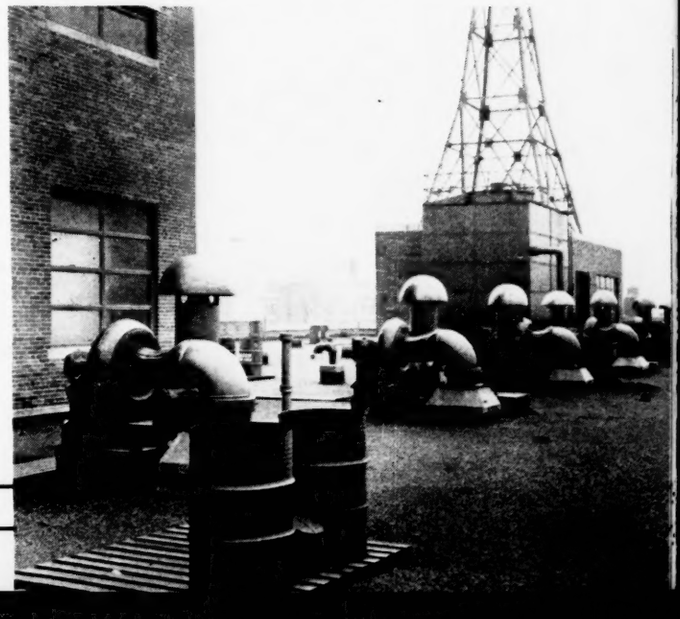
Rubber Testing Room and Conductimeters.—Two special testing rooms occupying 500 sq ft and requiring the same dewpoint temperature are grouped together and supplied from a single central station air conditioning system of 3,200 cfm capacity.

One room, used for rubber testing at any condition between 70F dry bulb and 64% relative humidity, and 82F dry bulb and 45% relative humidity, while a condition of 75F dry bulb and 55% relative humidity is required in the room for Conductimeters.

All the room conditions are maintained by use of supply air at a constant dewpoint temperature, and reheated when necessary to obtain the variable room conditions on a year-round basis. In summer, 17 gpm of chilled water is supplied to obtain a refrigerating effect of 7 tons for the rooms. In winter, outside air up to full system capacity may be used, and relief is discharged above the roof level.

Hot Room.—The Hot Room was designed to provide any dry bulb temperature between normal room temperature and 160F, with a corresponding relative humidity of 50%.

A view of the roof showing the cooling tower in the background and the laboratory's exhaust fans.



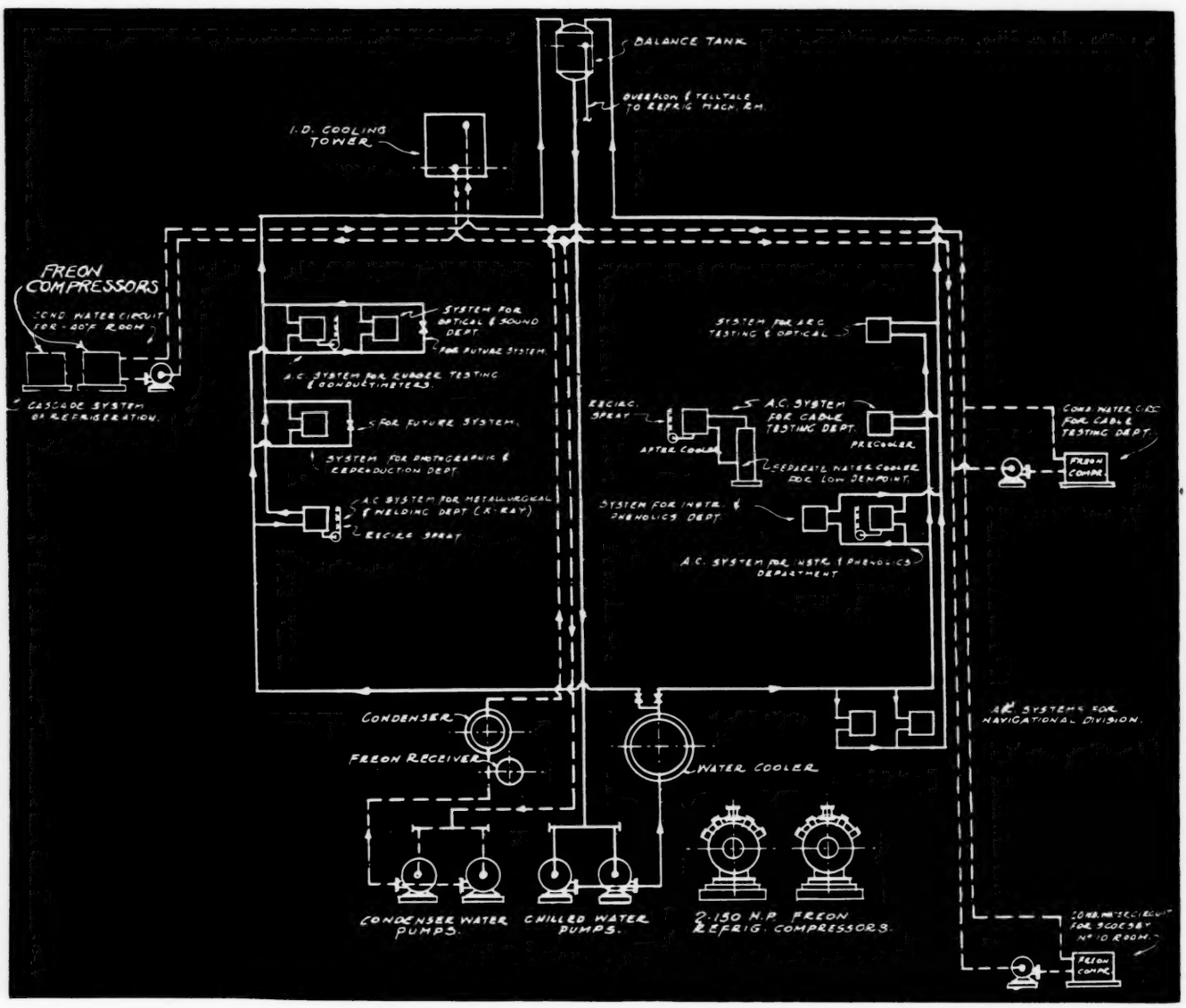
The room is constructed with a vapor-proof stainless steel lining for walls, ceiling and floor on the inside surfaces, to prevent the high humidity from striking through and saturating the surrounding building structure. Structural walls are 4 in. salt glazed tile and 2 in. of impregnated insulation; the ceiling of cement plaster and insulation; and for the floor, the stainless steel lining is laid on the concrete slab with 4 in. of additional concrete over the lining for a wearing surface.

A recirculating unit of 1,000 cfm capacity with filters, heating coils, spray chamber and water heater is located adjacent to the room for maintaining the desired conditions.

—40F Room.—The Cold Room required a variable room temperature down to —40F. This system was designed with a separate refrigerating plant entirely apart from the central system except that condensing water is circulated through the cooling tower in summer. The refrigerating plant consists of Freon compressors arranged for two stage operation, or a Cascade system, with a 30 hp low temperature compressor and condenser cooled by Freon from a 15 hp high temperature compressor, whose condenser is water cooled. A recirculating evaporator is mounted directly in the room to be cooled and the refrigerating equipment is located just outside this room.

Construction of the room is similar to that of a standard ice box. Walls, ceiling and floor are 12 in. cork with 3/16 in. asphalt plaster over the exterior surfaces. The room is isolated from the building structure except for the floor. For a vapor barrier a 1/4 in. steel plate lining is used with all joints welded, and forms the interior surface. The floor has a 4 in. concrete wearing surface placed over the steel lining. Double doors and a vestibule are used and these are constructed of 6 in. cork covered with 7/8 in. wood and the doors then completely covered with 26 gauge galvanized steel, and triple gasketed at cracks and openings. A single large door is provided to permit entrance of large equipments that are to undergo tests. A removable vision panel is located in one wall constructed of 5 panes of 1/4 in. thick glass which form four dead air spaces equipped with defrosting units in the air spaces. Operating controls for the equipment under test are located on the wall directly

Schematic diagram of the chilled water and condensing water piping.


BALANCE TANK
OVERFLOW & TELLTALE TO REFRIG. MACH. RM.
I.D. COOLING TOWER
FREON COMPRESSORS
COND. WATER CIRCUIT FOR -40°F ROOM
CASCADE SYSTEM OF REFRIGERATION
SYSTEM FOR OPTICAL & SOUND DEPT.
FOR FUTURE SYSTEM
A.C. SYSTEM FOR RUBBER TESTING & CONDUCTIMETERS
FOR FUTURE SYSTEM
SYSTEM FOR PHOTOGRAPHIC & REPRODUCTION DEPT.
A.C. SYSTEM FOR METALLURGICAL & WELDING DEPT. (X-RAY)
RECIRC. SPRAY
SYSTEM FOR A.R.C. TESTING & OPTICAL
RECIRC. SPRAY
A.C. SYSTEM FOR CABLE TESTING DEPT.
AFTER COOLER
PRECOOLER
SEPARATE WATER COOLER FOR LOW DEW POINT
COND. WATER CIRC. FOR CABLE TESTING DEPT.
FREON COMPR.
SYSTEM FOR INSTR. & PHENOLICS DEPT.
A.C. SYSTEM FOR INSTR. & PHENOLICS DEPARTMENT
A/C SYSTEMS FOR NAVIGATIONAL DIVISION.
CONDENSER
FREON RECEIVER
WATER COOLER
CONDENSER WATER PUMPS.
CHILLED WATER PUMPS.
2-150 H.P. FREON REFRIG. COMPRESSORS.
COND. WATER CIRCUIT FOR SCIENTIFIC NO. 10 ROOM
FREON COMPR.

under the vision panel, so that it is not necessary to enter the room.

Partial Cooling. — Many small interior rooms throughout the building have high internal sensible and latent heat gains due to equipment and processes located therein, but have a comparatively small people load. Outdoor air supply and exhaust ventilation for these rooms was designed on the basis of a 10F rise in the rooms above the outdoor condition and the cost estimated. It was then found that if air were recirculated with a minimum quantity of outdoor air, through four small central station systems having chilled water coils, and the air quantity determined on the basis of a 25F differential, a saving in first cost could be realized. This was true since chilled water piping risers would already be in place and for a comparison, chilled water runouts and the increase in central plant capacity need only be considered for the refrigeration required. Also, the exhaust system required in conjunction with the proposed outdoor air ventilation could be eliminated and a substantial reduction made in the capacity of the outdoor air supply system.

Nothing is claimed for this method of relieving the interior rooms, except that it produces a dry bulb temperature 10F below that which could be obtained by the use of outdoor air ventilation; it saves valuable floor space which was at a premium in the building; and it provides a constant outdoor air supply sufficient for the number of occupants in the rooms. As provided for the areas which are air conditioned, the four systems mentioned may supply up to 100% outdoor air in winter. The area thus treated comprises 11,200 sq ft, and is the total for the 3rd, 4th and 5th floors. In summer, 40 gpm of chilled water is required to produce a total refrigerating effect of 31.5 tons.

Ventilation

Chemical Laboratories.—The Chemical Laboratories, which occupy part of two floors, consist of Rubber and Asbestos Testing and Research Laboratories, Steel and Alloy Laboratories, and General Laboratories for Testing Phenolics, Petroleum, etc.

General outdoor air supply ventilation was included in connection with local exhaust from chemical stoneware hoods located on the laboratory furniture. The hoods completely enclose processes where corrosive, explosive and poisonous fumes are generated, and it was necessary to exhaust certain hoods individually to eliminate fire and explosion hazards.

The arrangement of the exhaust system consists of thirteen small, individual systems, each serving three or more single or double hoods, at a single floor. Square chemical stoneware ducts, of the same width as the building columns, were located at the center line of each of two sides of the interior columns. Space was provided for pipe shafts between the ducts and the columns, and the whole arrangement enclosed with rectangular panels which are removable. To effect this arrangement, the structural steel framing in the floor was offset and designed around the ductwork and piping risers. Branch ducts leave the risers at right angles to the building axes from base elbows or tees, of chemical stoneware which are provided with condensation pockets and lead drains.

Laboratory furniture is located flush with the enclosed pipe shafts so that it is possible for the numerous branch mechanical and electrical services to be run above the floor, and concealed inside the laboratory furniture.

Horizontal branch ducts between the risers and the exhaust hoods were constructed of steel, protected with two coats of asphaltum, to effect a saving in first costs.

On the roof, cast iron centrifugal exhaust fans are located at each riser and are electrically controlled from remote push button stations with pilot lights, mounted adjacent to the hoods which they serve. The fans are painted to resist corrosion and the housings drained of condensation, while all ductwork at the roof is constructed of chemical stoneware. Flexible connections between fans and ductwork are woven glass fabric, fused to their points of connection.

The Chemical Laboratories occupy 10,400 sq ft of floor area and 32,650 cfm may be exhausted under full operating conditions.

Electrical Sub-Station.—The total heat gains from equipment in the electrical sub-station for the building were substantial, and outside air ventilation was installed here for this reason. The station occupies 5,000 sq ft of floor area and a system capacity of 20,000 cfm is required.

Supply air ducts were designed in conjunction with the electrical equipment layout so that air supply outlets occur over equipment having high heat losses and in the working spaces.

In summer the air supplied is exhausted by means of propeller fans. In winter, no heat is provided and the system proportions outdoor and recirculating air to maintain 70F in the sub-station, by utilizing the heat gains from equipment.

Main Power Switchboard.—The room used for arc intensity analysis in the Optical and Sound Department at the 5th floor required special supply and exhaust ventilation. Here high air velocities or drafts were highly objectionable, the heat losses from equipment were quite high, and fumes of nitrous oxide and cyanogen were generated by the arc.

Outdoor air (4000 cfm) was introduced behind the electrical switchboard in the room through 12 standard filter cells mounted at the bottom of the supply duct, formed into a plenum and extending the length of the room. This permitted introduction of the supply air with a minimum of air motion in the space. An insulated conical hood was located above the arc lights, which picks up 4,500 cfm of exhaust air at the periphery of an adjustable conical baffle, located inside the hood.

Outdoor air was used here for ventilating rather than air cooling with chilled water or evaporative cooling, for two reasons. Most of the heat generated was in the form of radiant heat, which will keep the operators in a perspired state, regardless of the room temperature, and the introduction of air well below room temperature could have a deleterious effect on the operators. Also, the air quantity determined on the basis of any type of cooling was too low for proper dilution of the fumes generated.

Battery Department.—Tests for dry and wet batteries are conducted in the Battery Section which occupies part of two floors, and extends over 10,000 sq ft of ventilated floor area.

An outside air supply ventilation system is provided, of 11,000 cfm capacity, together with exhaust ventilation in an equal quantity.

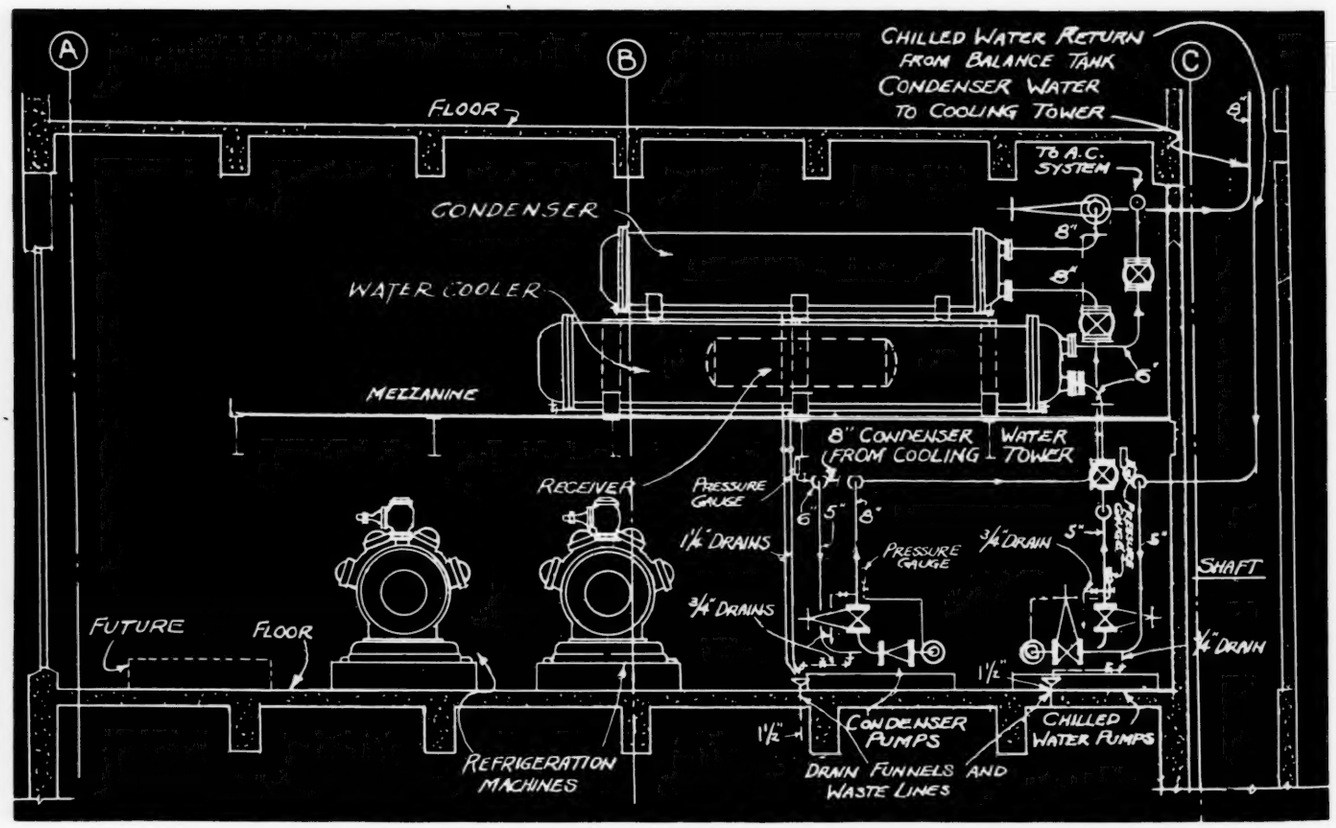
The supply ducts and outlets are arranged for general distribution in the working areas of the room. A series of motor generator sets totalling 800 hp are hooded by means of drop panels from the ceiling, and exhaust inlets are located over the sets inside the hood. The wet cells being subjected to tests require special exhaust ventilation. Acidproof ducts are connected to each cell and the quantity of air exhausted may be varied by a room by-pass connection at each cell. The purpose of the by-pass is to control the temperature and the rate of evaporation of the acid in the cells.

The control switchboards, together with resistors which are mounted above the boards, were relocated in order to simplify the exhaust ventilation system required, and to improve the room conditions. The boards were grouped together into two units, close to an exterior wall and arranged back to back, with an access space between. They were then enclosed with sheet metal panels from the ceiling to the top of the board, and all around one end. At this end, unit type centrifugal fans were installed, exterior to the enclosure, and discharging outdoors. It is thus possible to operate the boards from the room side in an atmosphere that would otherwise become unbearable, because of the very high heat losses from the resistors. By exhausting the heat from the resistors in this manner, a considerable saving in ventilation capacity was realized, together with the added cost involved, and room conditions were improved beyond those that could be obtained by the use of a general ventilation system for the space.

Toilet Exhaust.—All toilets, locker and wash rooms throughout the building are located in the interior bays and occupy a total of 10,000 sq ft of floor space. General exhaust ventilation was provided here and a single exhaust fan, of 23,000 cfm capacity, was located in a penthouse on the roof.

Power Section—Resistors.—In the Power Section a special hood, 60 ft in length, was installed over a bank of electrical switchboards and resistors. The hood is constructed with 6 in. x 48 in. dampered exhaust inlets spaced approximately 6 ft on centers, and with 12 in. x 18 in. dampered outlets on the same spacing. In summer, 7,500 cfm is exhausted through the 6 in. x 48 in. inlets in the hood, to remove the heat generated in the resistors. Two out-

Section through refrigerating machine room. This plant has a capacity of 3000 tons and supplies 550 gpm of chilled water at 45F for the air conditioned systems throughout the building.



door air supply ventilating units are located at the exterior walls of the space, which occupies 5,200 sq ft of floor area. The outdoor air units supply the only steam heating installed here and this was designed for below the winter heating demand for the space. In winter, the exhaust inlets for the hoods may be adjusted to a full closed position and the 12 in. x 18 in. outlets in the side of the hood, near the apex, adjusted to full open by means of standard window sash operators. In this way the hood is used as a giant convector, and the losses of the resistors are utilized in heating the space. The exhaust fan is provided with automatic volume control, and the quantity of outdoor air supplied by the two units is controlled from the position of the exhaust fan damper.

Welding Booths. — Booths for gas and electrical welding and for welding generators in the Metallurgical and Welding Department are ventilated by an exhaust system of 4,400 cfm capacity. Secondary air supply is drawn into the booths from surrounding rooms, so that the booths are held at a slightly negative air pressure. The exhaust fan is located close to the booths and the discharge is carried in a welded duct and exhausted above the roof. Exhaust inlets of flexible metal hose are located on each bench for directly removing the fumes generated in the welding process. A by-pass connection is provided so that air may be exhausted through a room inlet or through the flexible hose connection, as desired.

Mercury. — Exhaust ventilation for the mercury still consists of a double hood enclosing the still on three sides and the top, and extending down to the floor. Adjustable inlet slots were provided the full width of the sides and back at the floor line. Slots were also provided around the opening in the hood into which the still sets, for exhausting a total of 1,700 cfm. The top of the hood is formed into an enclosed double inlet fan having two rotors. Dampers are provided for automatically varying the volume of air exhausted, depending on operation of the still.

Salt Spray Cabinets.—For hot and cold salt spray and immersion testing of materials, the tests are conducted inside of cabinets which must be purged of the salt vapors at the conclusion of the run. Exhaust inlets on each cabinet are connected to duct work constructed entirely of Transite. Glass fabric collars are used to connect the duct work to a centrifugal fan constructed of cast iron and protected with asphaltum for resistance to corrosion. The air exhausted from the cabinets is discharged above the roof, and away from other equipment located there.

Dust Collecting System.—The carpenter shop and the Sample Preparation room in the Instrument and Phenolics Department are equipped with a recirculating dust collecting system with hoods over wood working machinery, duct work, pre-cleaner, dust precipitator, hopper and filters for removing shavings and sawdust from the air.

For rough grinding and polishing of metals in the Metallurgical and Welding Department, a metal dust collecting system is installed, similar to that described above.

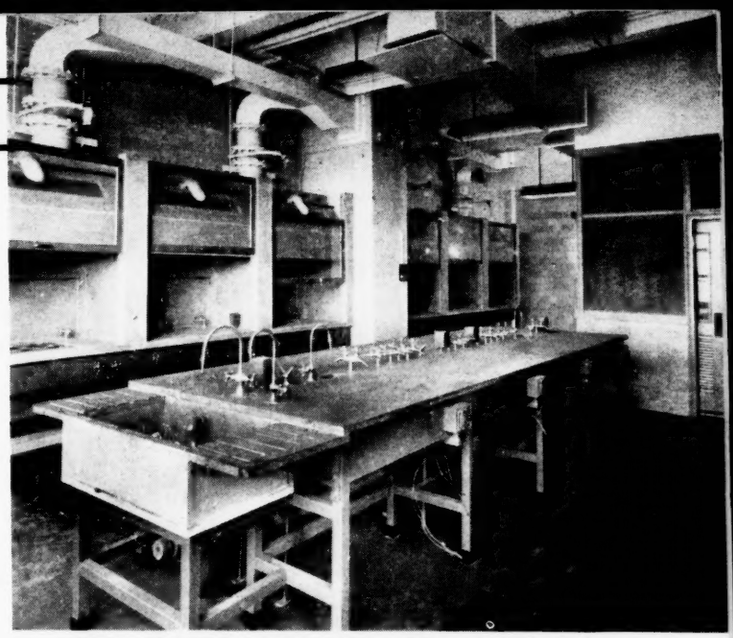


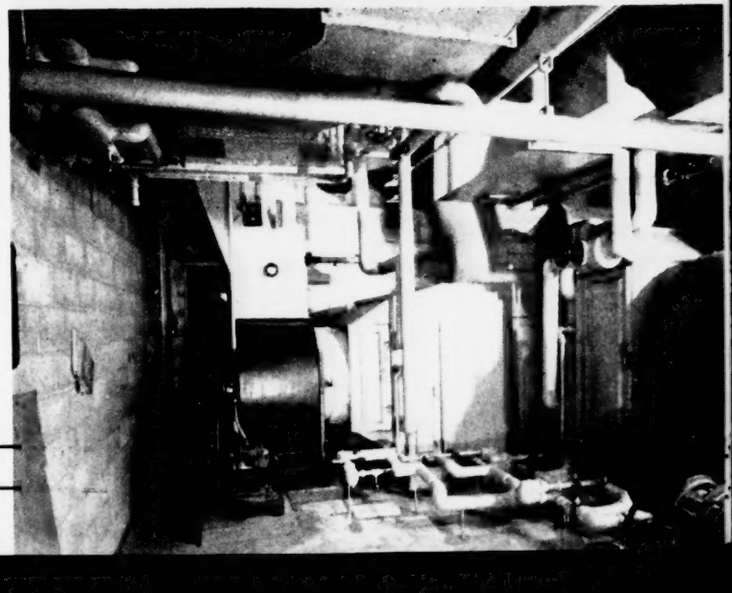
Photo of typical laboratory tables as installed on the second and third floors. A supply duct is shown at the upper right and exhaust at the upper left.

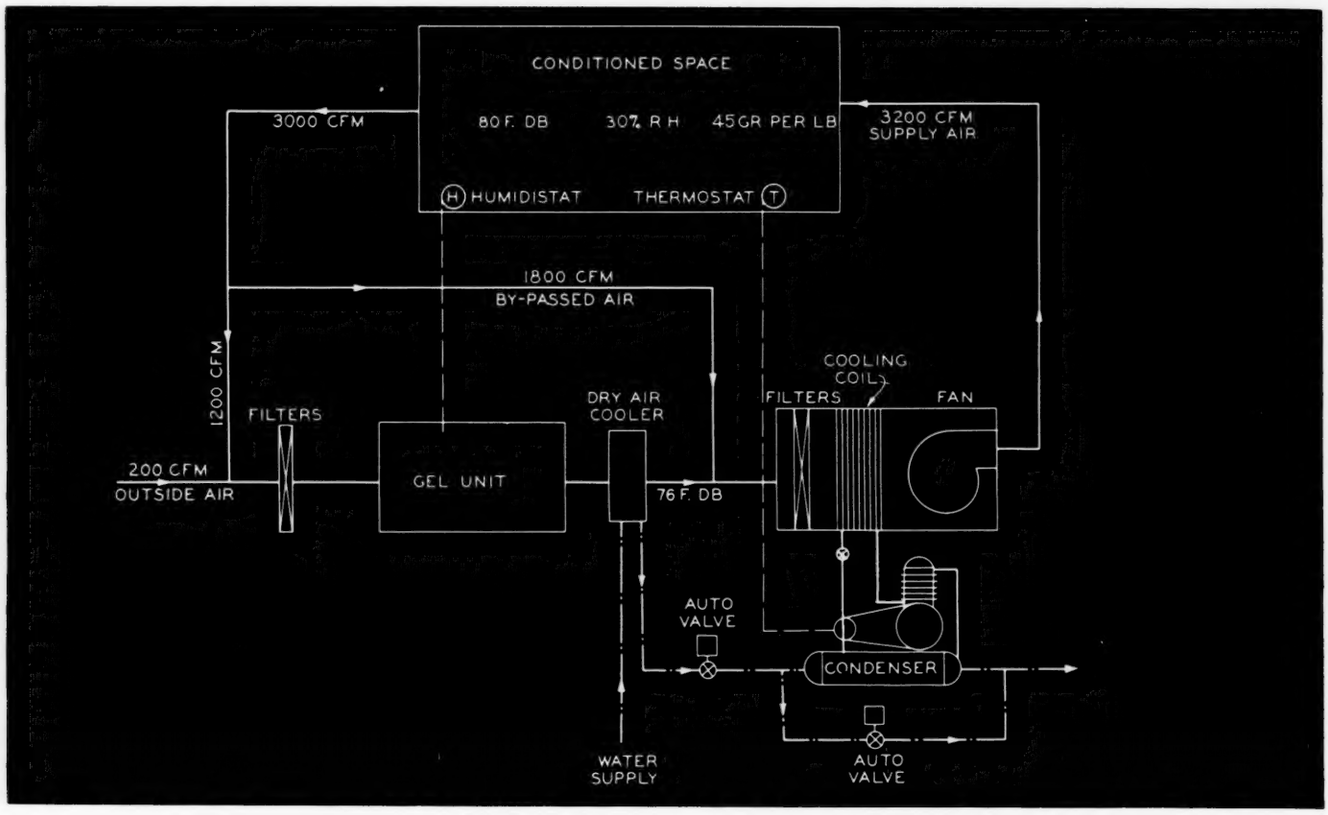
Propeller Fans.—A total of 24 propeller exhaust fans are installed in the sash throughout the building. These provide local exhaust from exterior rooms having high heat losses from equipment.

An exhaust capacity of 81,000 cfm may be secured from the fans when they are operated at high speed. In some cases, equipment was relocated from interior partitions to benches along the exterior walls and propeller fans were installed above in the sash, so that air is exhausted directly outdoors. In this way, duct work and fan systems involving considerable expense were avoided. In general, where the exhaust air contained smoke or corrosive fumes, it was carried up to the roof through exhaust ducts and discharged a sufficient distance from equipment located there, to prevent injury to the building structure or to equipment.

Wherever propeller fans were installed, outdoor air louvers were provided in the sash, of uniform size and spaced uniformly, so that interruptions occurring in the lines of continuous sash assume a definite design, and harmonize with the exterior elevation of the building.

Fan room on the second floor at the south end of the building showing blowers, conditioner and piping.





Schematic diagram of dehydrating equipment as used at Romanoff Caviar Co. plant.

Romanoff Caviar Company

★ ★ ★

finds packaging of bouillon cubes easy in air conditioned room; dehumidified air solves problem of hygroscopic powder sticking to machines; eliminates shut-downs.

By A. A. GIANNINI†

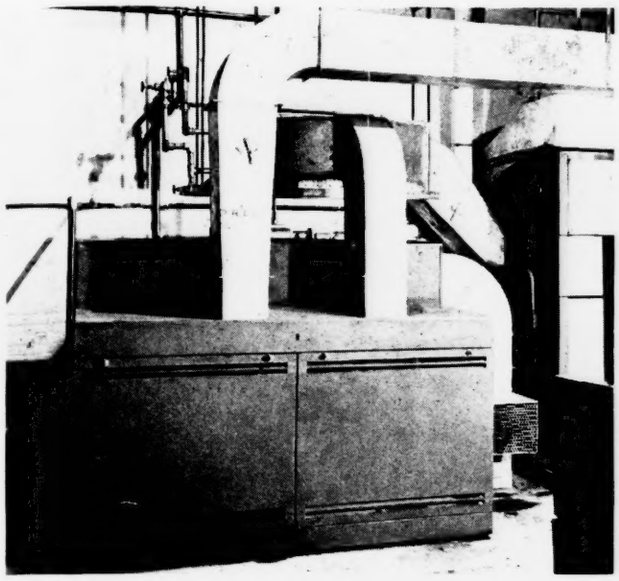
THE immediate big war time need for dehydrated or concentrated foodstuffs is built around the great savings in weight and shipping space. Thus, for example, bouillon cubes (beef, chicken and vegetable) are in great demand by the Army, Navy and Lend Lease.

The Romanoff Caviar Company, well known manufacturer of high grade bouillon cubes, have adopted air conditioning *as a vital production tool*—enabling uniform, uninterrupted production during all seasons of the year. The ingredients from which the cubes are made are first carefully blended and then the mixture is dehydrated under controlled temperature and humidity conditions of air in specially designed gas-fired compartment dryers. The dehydrated mixture is then transferred to machines which form the cubes and wrap each cube individually in cellophane. Because of the presence of salt and other ingredients bouillon cubes are highly hygroscopic and, therefore, packing operations must take place in a dry atmosphere. For sanitary reasons the air must be clean as well as dry. Without air conditioning in humid weather the bouillon powder will stick to the machines causing frequent delays for cleaning and often forcing complete stoppage of production. This is a problem common in the packaging of many dehydrated products such as coffee powder and lemon juice. † Obviously, with an unlimited war time demand for dehydrated foods, such stoppages cannot be tolerated.

In order to properly design an air conditioning

†Dehydration Engineer, Carrier Corporation.

†See "What the Air Conditioning Engineer Should Know About Dehydrated Foods", HEATING AND VENTILATING, Dec., 1942.



Gas-fired silica gel equipment for maintaining low humidity for the automatic packaging of dehydrated food.

system where such a hygroscopic material is handled, it is usually necessary to know something of the moisture regain characteristics of the material and, since these vary widely for different products, they must usually be determined experimentally in each case. However, the primary object of the air conditioning system at the Romanoff Caviar Co. is the elimination of trouble in the packaging operation. The only item of information required here is the relative humdity (at normal temperature) below which the powdered dehydrated product will not become sticky. To determine this a series of tests was conducted by the Romanoff Company and the air conditioning contractor with the cooperation of the Consolidated Edison Company of New York, utilizing the laboratory facilities of this prominent utility. Samples of dehydrated bouillon powder were observed under different combinations of temperature and humidity. It was found that a satisfactory condition for handling and compressing this material was 80F dry bulb and 30% relative humidity. Of course, an even lower humidity would be better, but 30% was found to be the highest humidity to which the powder could be exposed without becoming sticky. 80F, 30% R.H., therefore, became the design conditions for the air conditioning system serving the room.

Because of the comparatively low dewpoint to be maintained, consideration was given to the increased latent load caused by moisture migration through walls.‡ Careful consideration also was given to infiltration of moisture through cracks and to moisture load caused by opening of doors, since experience indicated that when there is a great difference between inside and outside moisture vapor pressure, there can be an infiltration of moisture despite an outward flow of air. As a result the load calculations indicated a comparatively large latent load, particularly at partial loads such as would exist on a sunless humid day.

To handle this job a so-called "split system" was selected wherein a silica gel dehydrator is used in combination with Freon refrigeration equipment. The flow diagram is shown in the drawing.

As indicated on the drawing, a mixture of recirculated air and outside air is passed through the Carrier dehydrator. The dried air leaving this unit is then cooled to 76F by the extended surface dry air cooler. It should be noted that a silica gel dehydrator dries air adiabatically, the total heat entering and leaving the apparatus being approximately equal. In effect, the dehydrator converts latent heat into sensible heat at an elevated level where it can be easily removed by cooling with water at comparatively high temperatures. It is for this reason that the dry air cooler is usually considered an integral part of the silica gel dehydrator, although under present commercial construction they are separate pieces of apparatus.

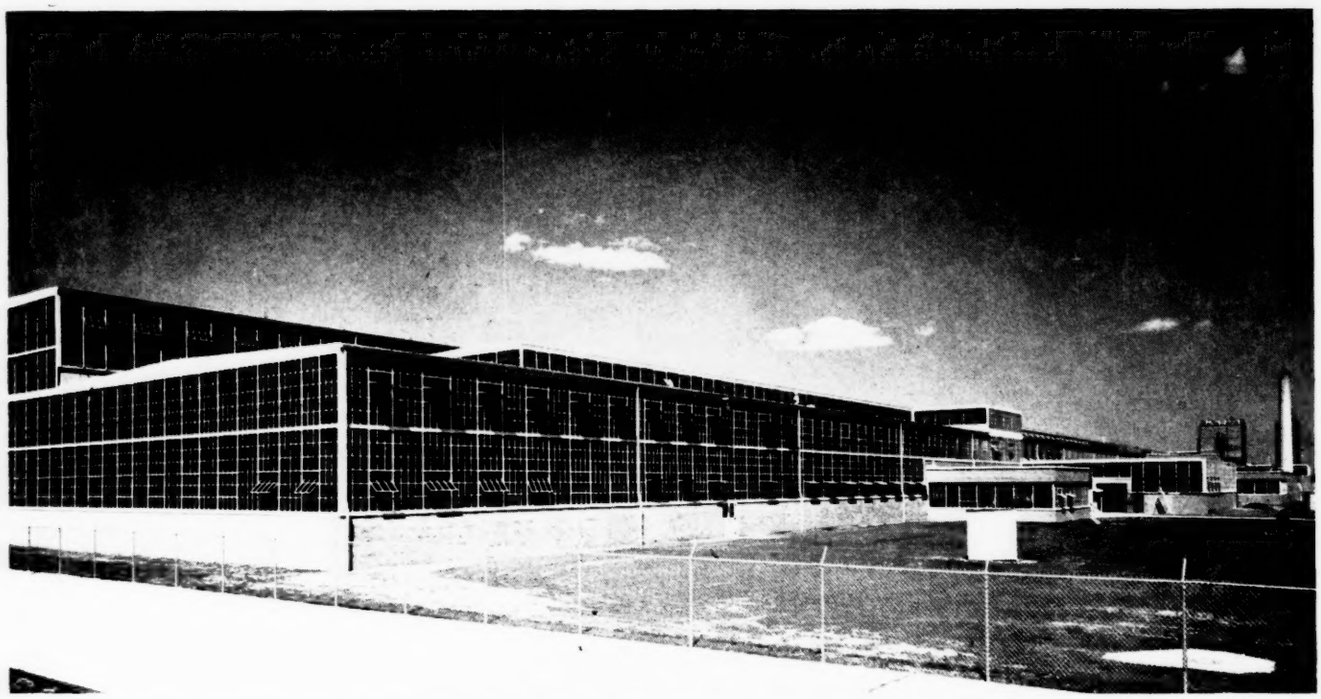
The air leaving the dry air cooler is mixed with by-passed recirculated air and the mixture is cooled to the desired dry bulb temperature by a direct expansion cooling coil. Under this arrangement the entire latent load is handled by the dehydrator, and the refrigeration equipment removes the sensible heat load. Independent control of temperature and humidity is achieved by having a humidistat control the operation of the dehydrator and a thermostat control the refrigeration cycle. By means of this independent control, it is possible to maintain conditions under any expected combination of latent and sensible load.

It was recognized that the same results could be obtained by the use of refrigeration and reheat with proper control, but the split system was selected because its operating cost was lower, particularly under partial loads. Operating costs, of course, are dependent on the price of utility services applying to the particular installation. In this case it was practical to take advantage of the availability of gas at low cost to provide the heat for regeneration of the silica gel since the Romanoff Caviar Co. is a large user of gas for other heating applications such as drying and sterilizing.

The success of the system is indicated by Rudolf Ricklefs, in charge of production at the plant, who said that prior to installation of air conditioning shutdowns frequently occurred during the summer months and sometimes on humid days in winter, whereas continuous and full production is now maintained in all weather, enabling the concern to fulfill its many government orders on time. Moreover, no longer need the leaving of unpacked merchandise exposed overnight be feared.

The installation in the Romanoff Caviar plant is another example of air conditioning's service to industry, and it is particularly significant because of the increasing importance of dehydrated foods.

‡See HEATING AND VENTILATING, Sept. 1942.



Continuous sash encloses the American Propeller Corporation's new plant. The modern boiler house shown at the right furnishes steam for heating the plant.

American Propeller Corporation

★ ★ ★

builds new plant for mass production of propeller blades from tubing; heating by largest steel heating boiler ever made by the manufacturer. Air conditioning provided for three sections of office portion of plant.

THE first mass production of propeller blades made by the unusual method of processing them out of a single piece of seamless steel tubing is under way for Army bombers at the large new plant of American Propeller Corporation "somewhere in the Middle West." The tubing is transformed into blades by a series of hot forging, cold pressing, machining and welding operations.

The plant is a monitor-type structure with shop-welded steel framework and has been laid out with exceptionally wide, clear areas which are obtained by 60-ft column spacing in aisles 80 ft wide. A 35-ft clearance has been maintained below trusses in the high bays where bridge cranes expedite the handling of equipment and mass production of the propeller blades.

The building is characterized by all the service facilities essential to efficient production with fluorescent lighting in offices, experimental shops and cafeteria, and a combination of mercury vapor and high-intensity mazda lighting in the plant proper.

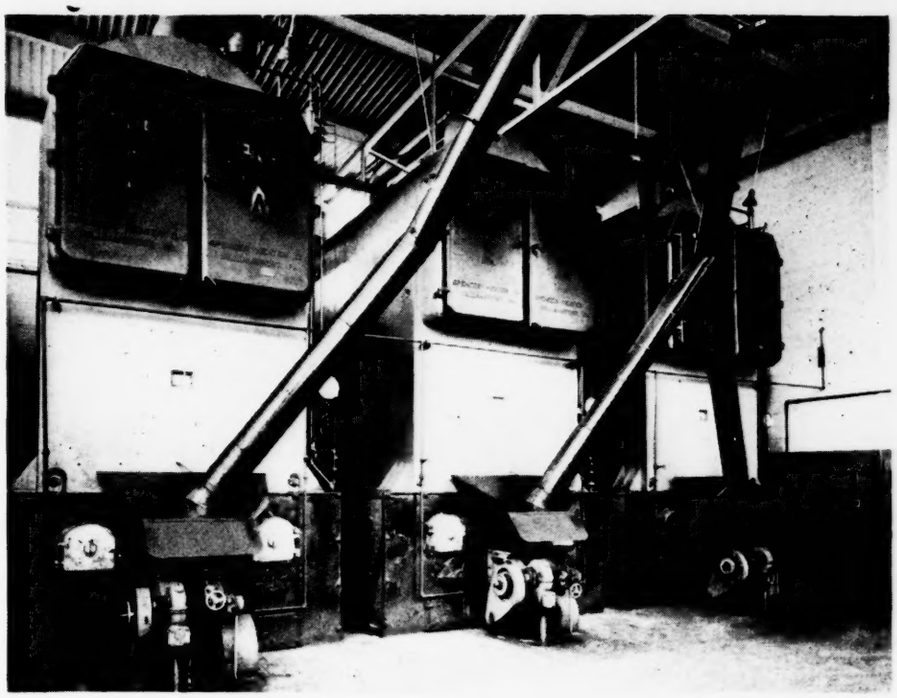
Steam for heating is supplied by Spencer Heater type-A steel tubular boilers, each with an S.H.B.I. net steam rating of 56,950 sq ft, which are installed in a separate power house. These boilers have a heating surface of 3350 sq ft each and are fired with Brownell Company's stokers, are supplied with boiler feeders, and operated at 10 lb pressure. The coal is handled by a Neff & Fry silo coal handling system of 500 ton capacity.

Coal is received and dumped into a track hopper and elevated to the top of the concrete silo where 50 tons is retained in a feeder pocket from which it is spouted to the boilers and the balance goes into the storage space at the bottom of the silo from where it is recovered by the same elevator which serves the track hopper and returns to the feeder pocket as needed. This silo has been equipped with heating coils to prevent freezing, and the section of spouts from the silo to the boiler room roof has been inclosed in an outer casing so that the warm air from the boiler room prevents this from freezing.

In addition to the heating boilers, which are the largest ever produced by Spencer Heater Division of Aviation Corporation, there is a separate oil-fired boiler and a storage tank for the generation of hot

This article approved for publication by the War Department

THIS PROJECT
designed and built by
The Austin Company



Three of the large Spencer Heater steel tubular heating boilers are shown here. The boilers have an S.H.B.I. net steam rating of 56,950 sq ft each and a heating surface of 3350 sq ft each. They are fed by stokers from a concrete coal silo.

Good lighting and effective ventilation prevail in the cafeteria in the Administration Building where comfortable temperature and humidity are maintained by two 12,000 cfm air handling units, operating in conjunction with an induced draft 800 gal. capacity cooling tower located on the roof.

Special propeller testing chambers have been set up inside this lofty monitor bay to expedite volume production. A bridge crane operating the length of this 80-foot aisle transports propellers on a special carrying rig. Typical steam supply and return piping to the unit heaters can be seen.

A section of the factory area. Projection type steam unit heaters, hung above the truss line, give a warm floor and well-distributed heat in this building.

The cooling, heating, and ventilating system of the Administration building, shown, produces an 80F dry bulb and 50% relative humidity inside when it is 95F dry bulb and 75F wet bulb outside. The system is divided into three sections, one for each of the two floors of this main portion, and one for a connecting wing.

Typical general office area in the Administration Building. All air-conditioning ducts are concealed above the ceiling, with Anemostats for admitting the air mounted flush, as shown. Wall radiation offsetting window heat loss is supplied with steam through concealed piping.

water. This is circulated through the plant by a circulating system through all the toilet rooms in the factory and the office and cafeteria.

The general heating system in the factory portion consists of vertical discharge unit heaters, although there are some portions used for Personnel Offices and other functions where cast iron radiation is used. The office portion of this plant is completely equipped with a cooling, heating and ventilating system which is divided into three sections. One section each for the first and second floor has a capacity of 10,000 cfm, and the third section, for the passage connecting the factory and which is flanked with offices on both sides, furnishes 4,000 cfm.

Cooling of the factory is provided by a 75 hp Westinghouse compressor, provided with unloaders, which supplies direct expansion Freon to all three air handling units. This system is designed to produce 80F dry bulb and 50% relative humidity when the outside temperature is 95F dry bulb and 75F wet bulb.

The distribution from the several conditioning units is done by duct work above the ceiling admitting air into the offices through Anemostats.

Cast iron radiation is used to offset the heating loss from the windows. Steam to the radiators is zoned for the east and west half of both the main building and the passage. The mains are run in the space above the office and fed down through a continuous grid to an underground equalizing steam main so that all radiators are fed up through the floor and exposed piping is kept at the minimum.

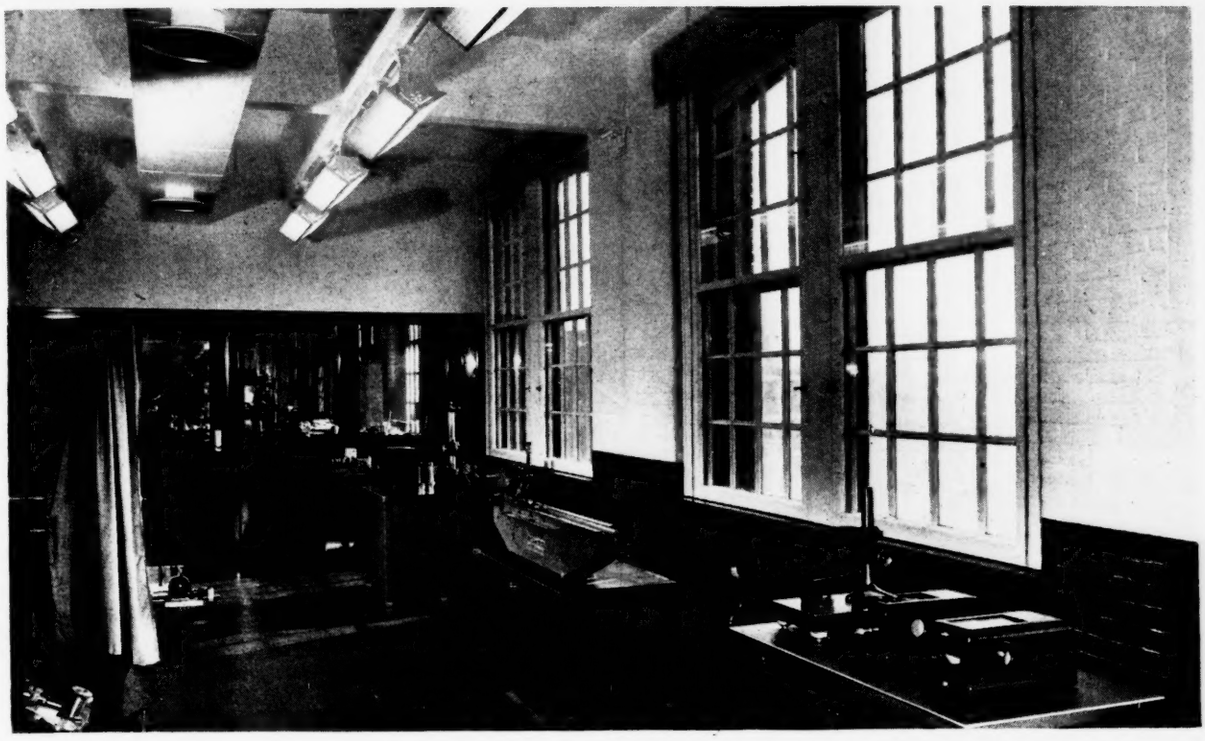
The balance of all heat required is furnished by the unitary equipment under return and comfortstat control which is designed to use outside air up to 100% cooling when the outside dry bulb and wet bulb will permit. This permits a considerable saving of refrigeration in summer and of heat in winter.

This system in winter, when the building is occupied, acts on a cooling cycle, since the light and human load account for an 8F temperature rise in the office area.

In the cafeteria there is a cooling system which consists of two 12,000 cfm air handling units operating in parallel to supply all heat and cooling to the cafeteria. The control for this system is arranged so as to permit the automatic introduction of outside air up to 100% to maintain conditions when heating or cooling are not absolutely required.

Exhaust fans are provided for the kitchen equipment and the air exhausted is obtained from outside and partially from the ventilating air from the cafeteria. Air from the cafeteria is limited to the make-up air necessary to offset the air removed by the exhaust propeller fans. Cooling water for the air conditioning equipment and some process cooling water is obtained from an 800 gallon induced draft Binks cooling tower.

Air conditioning equipment was installed by the Mechanical Heat & Cold Company, Detroit.



Gauge and tool laboratory in the Warner & Swasey Co. plant.

Save — Simplify — Substitute!

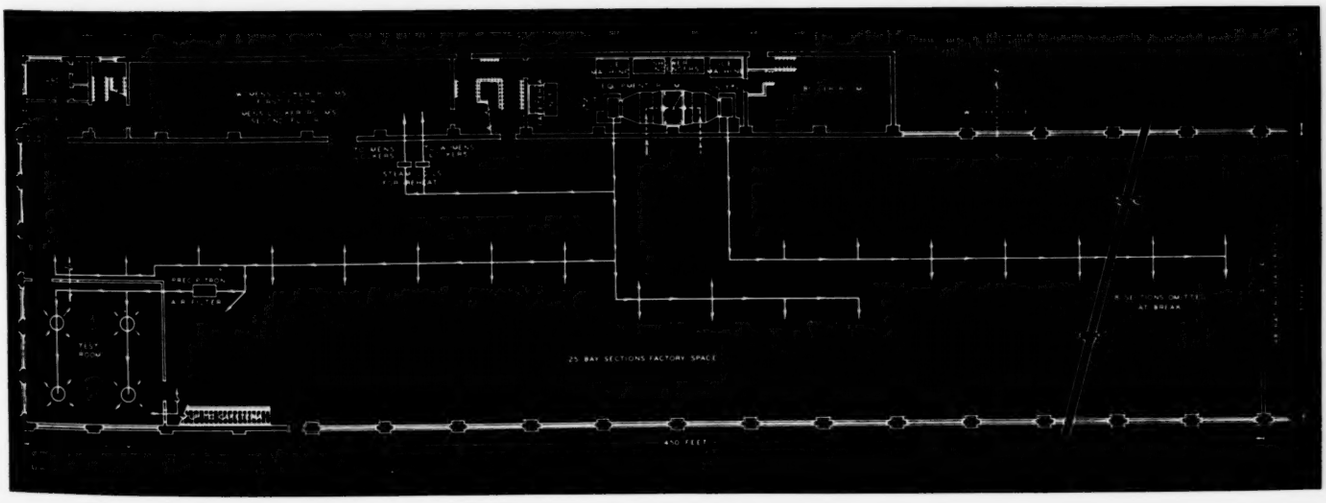
★ ★

Preceding articles show heating and air conditioning in a variety of war plants. But what about 1943, with all metals critical, with innumerable restrictions? The author gives examples in applying to air conditioning the above slogan of the refrigeration industry.

By LESTER T. AVERY

SAVE, SIMPLIFY, SUBSTITUTE! This is good advice for the refrigeration industry, and probably equally applicable to the air conditioning industry. Of course, one could raise a question as to just what the air conditioning industry consists of, as practically all of its component manufacturers, sales outlets, and installation contractors have a handhold on some other industry. For example, the refrigeration machine, fan, coils, controls, the hundreds of accessories necessary for air conditioning, are of first importance to some other industry such as the refrigeration, heating, ventilating and insula-

Fig. 1. Windowless manufacturing plant with two zones of conditioning. Separate reheating coils for locker rooms.



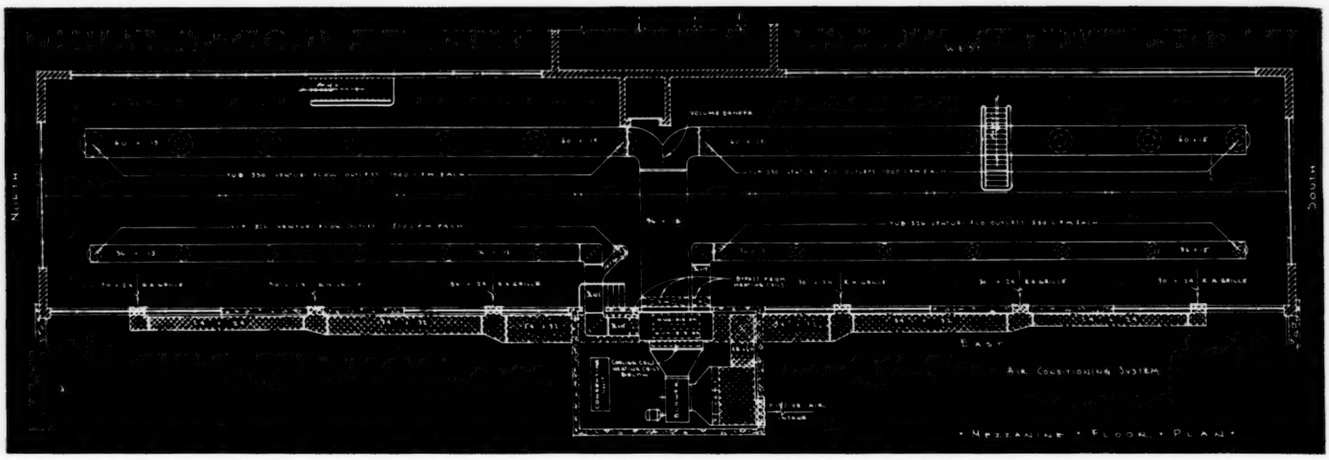


Fig. 2. Laboratory with four zones of conditioning required for sun effect.

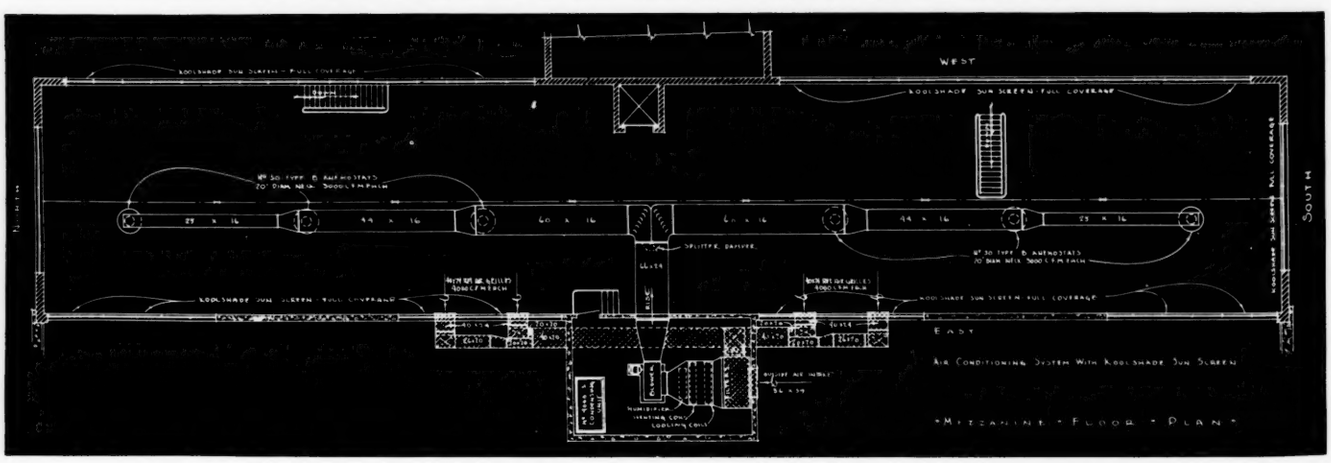
tion. Air conditioning may be better considered an umbrella under which are collected certain segments of these other more basic industries. Consequently, it seems logical to appropriate the foregoing slogan of the refrigeration industry and apply it to air conditioning to help *win* the war.

In savings, the obvious solution is to eliminate. To many war material manufacturers air conditioning meant some kind of cooling that was a pure luxury and could be set aside for the duration. These manufacturers felt they were thus saving *all* of the strategic materials which are needed for air conditioning and in this way they were co-operating in the conservation program. Let's raise our sights a little and see what has happened in some cases.

Early 1942 saw the planning of many war plants. The Blank Company had one on the boards that was *rush rush rush*. There was no time for any frills such as air conditioning, and no justification in the use of steel for control of temperature and humidity in a delicate manufacturing process. Ordinary heating and ventilating was good enough before the war and it was good enough now. So what happened? So the roof was designed with row on row of skylights, framed in steel. The side walls were continuous steel sash. The shop runs 24 hours a day and the lights are never turned off. Ventilation is the open window control type which lets in all the street dirt and noise and forms an excellent opening for sabotage. This plant, 150 x 200 ft, took four months to build, delays for steel for the roof, trusses and skylights wasting about six weeks. *Was that saving?*

At the same time the EM Company planned a building, 70 x 450 ft, practically the same floor area as the Blank plant. This building was designed with a flat insulated roof, wood trusses, and glass brick side-walls. The heating, ventilating and summer cooling and dehumidifying were combined into one central system. At the time metal ducts were plentiful so that no effort was made to substitute except where ducts were to be insulated. A 120-ton refrigerating plant with atmospheric condensers, two zones of heating and cooling control, with a simple duct system (Fig. 1), was installed. The steel used was far less than in the roof construction alone in the Blank building. Installation of equipment kept pace with the building itself, which was in use 70 days after footings were started. Inside temperature does not vary more than 3F from one portion of the plant to another. The only openings into the building are the doors which are attended by guards. Filters in the air conditioning system screen out the dirt. Production is the same day or night, and it is likewise the same on hot, cool, or cold days. There are no

Fig. 3. Laboratory in Fig. 2 with one zone using Koolshade in windows.



rejects due to widely fluctuating temperatures, dirt, or hot weather fatigue. EM Company really *saved* by installing temperature and humidity control and made up for such control by leaving out the fancy skylights, fancy windows, trick window guards and closure equipment.

So much for saving. How about simplifying? *Simplify* is a good word, but what does it really mean to the industrial heating and ventilating problem?

June saw the completion of a fine new modern factory in which the heating was streamlined to the simplicity of four gas-fired unit heaters. Nothing could be simpler nor more economical in the use of strategic metals. Window ventilation was good enough during the summer although green paint was used liberally to reduce window glare, and the lights burn 24 hours a day, as do the occupants. The oil fumes rising from the machine tools and the odor from 250 people indicate the need for ventilation, but none was provided. The unit heaters were not sized to permit outside air for ventilation above the minimum of one change per hour. That's not enough to get rid of the smoke haze. No more gas unit heaters can be connected. There is no floor space in which to install a coal-fired unit heater. Therefore, since providing some ventilation meant additional heating, it was necessary to build a lean-to building to house the coal-fired heater, stoker, and coal bin. The question is raised whether the original planning was not *too* simple.

The Dash Company had plans prepared for a new office building. An important principle in heating is to be sure there is too much. Similarly, an important point in ventilating is to keep the ducts small but zone liberally, particularly for sun and wind effect. The Dash plans provided for a complete radiator system of heating and a supplemental 4-zone ventilating system with cooling and dehumidifying for the entire building. This plan could be simplified.

Recommendation was made, the building was re-engineered, and the job was installed to use one zone only and do the heating with the same system that did the cooling. All of the steam piping was eliminated along with the radiators. Forty percent of the sheet metal was saved in the duct system. Here simplifying meant saving, not only apparent but real, both in first cost and operating cost.

It's hard to go wrong on *substitution*. That means the use of substitute materials for war materials, chiefly metals. For example, ducts can be made of wood, asbestos, or any one of a number of materials. Use of steel instead of copper is another common substitution. But there are other substitutions not so obvious and equally important.

When the plans came out for the Dash Dash laboratory, 54 tons of cooling effect were needed with four zones of cooling control, on account of the sun load. (Fig. 2) Koolshade sun screens, although frozen under the copper M-9-c and other orders, are still available to war plants. Permission was secured from WPB to use these screens on the east, south and west windows. This saved 12 tons of cooling load and permitted the installation of a single zone. (Fig. 3) Thus a small weight of frozen stock (all completely fabricated and standing idle in storage) permitted the saving in the difference in weights of steel, copper, and other metals in the 42-ton (40 hp) refrigerating plant as against the original 54-ton (50 hp) plant. The saving in air-handling equipment was probably more significant; the total air handling was reduced from 22,000 cfm to 15,000 cfm. The single zone saved many pounds of metal ducts.

The Dot Company had to have more office space. The gas-fired boiler had all it could do to handle the existing office and simply couldn't be depended on to take care of the addition. A new warm-air furnace or a new boiler with a stoker would be the obvious solution, and WPB would quickly grant priority. There was a substitution possible, however, which worked quite satisfactorily: storm windows, plain wood-sash double-windows, were provided in old and new offices, an insulation was built into the new roof and added to the old ceiling. The result was that the existing boiler was ample in capacity so that substitution not only eliminated the need for new metal but reduced operating costs.

There is one other word which the air conditioning industry could well add to the slogan SAVE, SIMPLIFY, SUBSTITUTE. That word is SENSIBLY. Save sensibly, simplify sensibly, substitute sensibly. One may say that this is implied and that the authors of the slogan imply that all efforts in these directions would be done sensibly. However, it is possible that straight refrigeration delivering a definite result does not involve so much personal opinion as does air conditioning. There is, therefore, less opportunity in refrigeration work to commit these sins of omission and commission that are so common in heating, ventilating and air conditioning.

One important chance to be sensible comes in planning for a few years instead of one season. These fine new factories and offices are *not* going to be junked after the war. If there is any junking done it will be the old plants and buildings that should have been torn down years ago but survived through and because of the great depression, and have only a book value. If bombing is necessary to rid our cities of these old blighted areas, including factories, let's do it ourselves instead of depending on the bombardier. A little controlled voluntary sabotage directly after the armistice would do no end of good.

Furthermore, we haven't won the war yet, nor can we be sure it is a short one, so that in the true spirit of conservation let us join together to be sure that the metal, dollars—public and private—are expended realistically as did the EX Company. This firm had a factory to build, with offices on the top floor. Air conditioning was denied by WPB, which felt that metals could be better used elsewhere. Since the building is practically square, inside offices won't

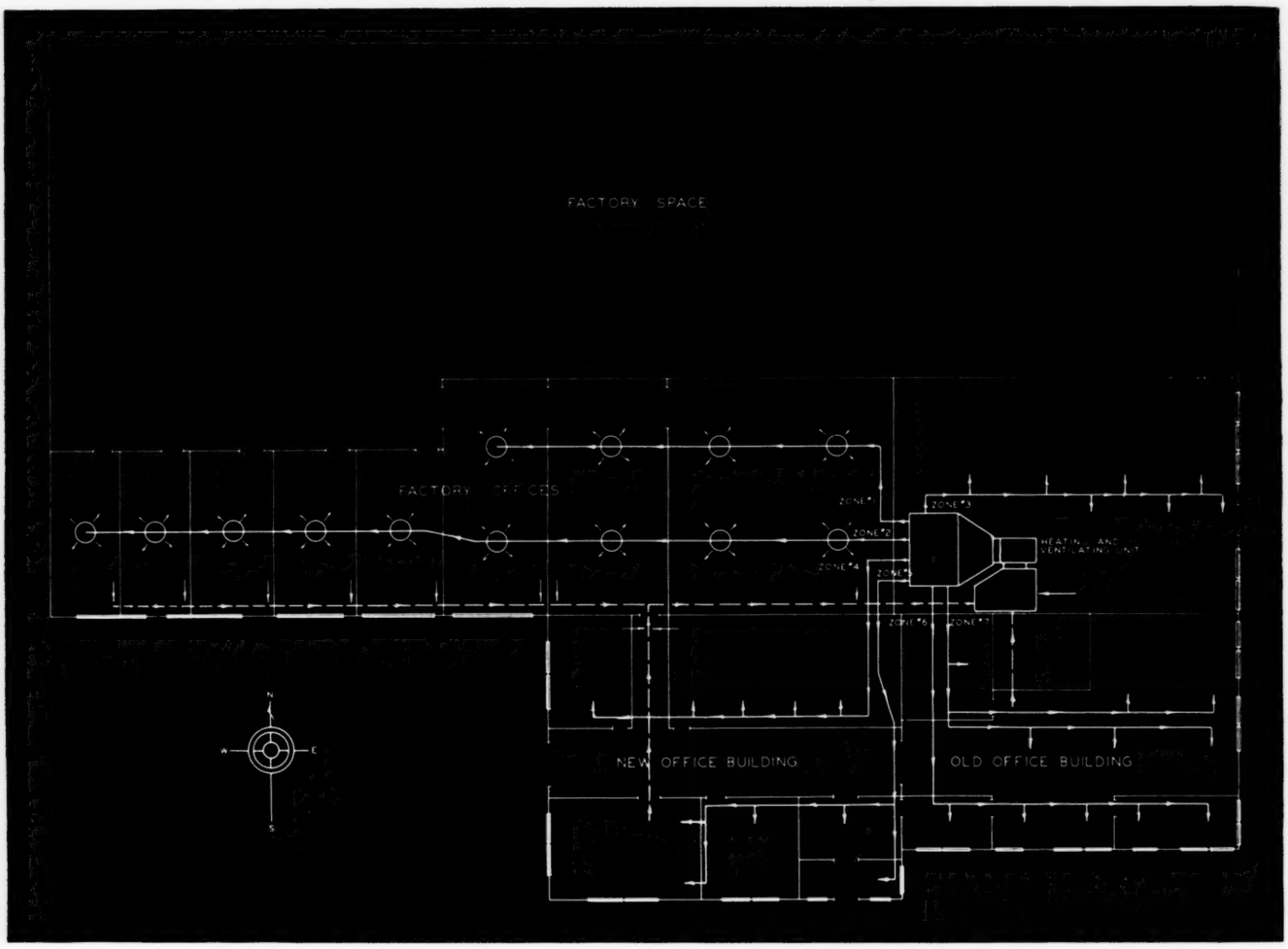


Fig. 4. Office addition showing the need for ventilation in the inner offices, old and new.

even get "window ventilation", while dirt; fumes and noise will be the lot of those occupants fortunate enough to be near the outside walls. The heating and ventilating were so designed as to provide a sensible solution. The ventilating system is laid out so that cooling can be added without any changes other than adding cooling coils and refrigeration when such equipment is again available. During a large part of the year outside air can be effectively used for cooling as the system is planned to permit up to 100% outside air. No materials, metal or otherwise, was wasted; no money misspent. That system is ready for cooling which may be available any time. If it is necessary to work 70 hours a week in the office so that the soldier can be supported in the field there may be a ruling early next summer permitting, in fact requiring, cooling and dehumidifying in drafting rooms and engineering offices—perhaps even in committee rooms where management and labor unite to work out common problems. The EX Company substituted, simplified, and saved sensibly.

The YY Company built an office addition in a corner between the original office building and shop. The new building cut off all light and air from one side of the old office and 125 feet of shop office. (Note Fig. 4) Ventilation of these cut-off inside rooms was necessary, heating was required for the new office, and ventilation was also needed for the inside room in the new office. The problem was approached with the idea of killing two birds with one stone—or was it three or four? A central system of heating and ventilating was installed to serve new and old offices, using non-metallic ducts. Equipment was planned to permit cooling to be added when, as, and if it is available. Double windows will be used to conserve heat, sun screens to reduce the sun load. A sensible solution was here found for the primary requirement.

When the industrial history of this war is being studied it will be found that the refrigeration and air conditioning industries made their contribution, not only in food preservation, product control, and elementary heating and ventilating, but by establishing a new high in the sensible use of the materials allowed. Who said the engineer could not work out a rational solution to this problem? Hundreds of new and old plants are wonderful examples of intelligent conservation insofar as the heating and ventilating systems are concerned. The foregoing examples are cited to aid in thinking through to a logical answer when we are forced still further to SAVE—SIMPLIFY—SUBSTITUTE.

WASHINGTON NEWS

Summarized by Loring F. Overman. Oil Ration Coupon Value Cut 10%; A. C. Maintenance Studied by WPB; Stoker Applications Handled Locally.

What has Washington in store, in 1943, for the heating, ventilating and air conditioning industries?

A general answer to this question will be found by following the annual January tradition, "Look Backward; Look Forward."

A backward look reveals that the United States has passed through two phases of its war production program—the tooling-up and the expansion stages. A forward look brings into view the adjustment stage, described by WPB Chairman Donald Nelson as involving "all-out mobilization and centralized direction."

First Phase

The first phase began in mid-1940, when a total of $12 billion dollars was made available in appropriations, contract and tonnage authorization, for all defense purposes. The period ended with Pearl Harbor, when the total program had reached $64 billions, expended largely to get ready to produce.

Early stages of the war program found heating, ventilating and air conditioning industries — as well as the rest of the country — carrying water on both shoulders. It was the "guns **and** butter" period.

In 1941 the United States boosted tank production from virtually zero to many hundreds a month, and at the same time produced 3,700,000 electric refrigerators. Some 50,000 machine guns were produced, as were more than 1,500,000 typewriters. Plane production of about 2,000 a month was achieved in the same year that saw production of an all-time high of 5,000,000 motor vehicles, decorated with chrome and stainless steel bright work. Millions of tons of steel went into bedsprings, farm machinery, eggbeaters, washing machines, school buildings, railroad locomotives and hundreds of other civilian products, and there was enough steel besides to achieve production of 125,000 deadweight tons of maritime shipping in a single month.

Second Phase

Although Pearl Harbor ushered in the second phase in December of 1941, it wasn't until a month later—January 6, 1942—when the President set production goals startling the world, that industry fully realized war is a full-time job.

As total appropriations for war purposes bounded from $60 billion to $100 billion, $200 billion and $238 billion, the primary task of converting industry to war production was rushed. There was not time to plan a nicely balanced program. There was only time to start producing as fast as possible.

In early February the WPB issued an order which loosed the might of America's greatest industry against Hitler: production of automobiles was stopped.

In quick succession came limitation orders to insure that steel, copper, aluminum and a score of other materials went into war goods, and that industry went to work producing them. Within a few months the great consumers' durable goods industries were virtually shut down, as such, for the duration.

Construction, however, was booming. Airfields, cantonments, barracks, ammunition plants, synthetic rubber plants, housing for war workers—contracts were let and work was rushed throughout the land. The 1942 construction program within the United States totaled some $13 billion—the greatest in history.

The production curve climbed steadily. In March the rate of munitions production was twice what it had been in November, 1941. By June it was three times greater. The President announced that nearly 4,000 planes were produced in May.

Then production began to falter, and the answer was, in part, materials shortages and the problems of scheduling that these shortages increased. More steel, copper and aluminum were being produced than ever before, but not enough.

In the meantime, in spite of some clogged channels and bottlenecks, the rate of production continued to climb until it was more than four times greater than it had been a year before.

By the end of the year the monthly rate of U. S. military plane production was twice that of Germany's. The U. S. and the United Kingdom together were producing two and one-half times as many planes as all of Axis Europe combined. United States war production at the end of 1942 was equal to that of all the Axis nations, and the United Nations were out-producing the Axis almost 2 to 1.

Third Phase

"As 1942 ended, the United States entered its second year of war and the third phase of its war production program", WPB reports. "In 1943, the overall war program will have to be intensified to do a better than 90-billion-dollar war job. Production for war alone will have to equal the value of all the goods and services produced by the nation in its years of greatest prosperity. It will have to produce two thirds again as much as in 1942. Attainment of these goals would mean that by the end of 1943, the United States alone would be out-producing the Axis two to one, and with its allies will be out-producing the Axis three to one.

"In the third stage every man and every pound of critical materials must count. The war production labor force grew from 6,900,000 in 1941 to 17,500,000 in 1942. At least 5,000,000 more workers will be needed in 1943; no man or woman can be wasted. Faced with filling staggering demands for munitions, food, clothing, transportation and communications and all the other things needed on the home fronts of the United Nations and the military fronts of the world, the United States can waste nothing that could be used to make the enemy weaker and the United Nations stronger."

Pattern Set

It is impossible to forecast the exact pattern of WPB-OPA-ODT-WMC, etc., impacts upon the heating, ventilating and air conditioning industry, but it is known it is planning a 1943 in accordance with "Phase Three" of the war program. Thus it should not be too difficult for the individual within each industry to estimate what his position is to be. Roughly the rule should be, "if it isn't essential to winning the war, it's out."

With the exception of emergency orders issued to alleviate suffering

during recent cold weather, all orders issued by OPA and both the Air Conditioning section and Plumbing and Heating Division of WPB have followed the general pattern of tightening up more and more on civilian economy.

One such exception was the December 21 announcement by WPB Plumbing and Heating Division that applications for Class A stokers in capacities under 1,200 pounds of coal per hour will be processed in the district Offices of WPB in Regions One, Two and Three. These Regions comprise the major part of the eastern seaboard, where the fuel oil situation is most critical.

"The effect of this action," Joseph F. Wilber, Director of the Plumbing and Heating Division, explained, "is that any institutions, business establishments, or individuals who feel that they must have a stoker in order to convert their plants can go to the nearest local War Production Board Office and receive an answer as to whether or not the machine can be supplied at this time."

"So far as Class A stokers are available or can be manufactured, it will be necessary that the equipment be put to the best possible use," Mr. Wilber declared.

A check-up of more than 1,500 applications for stokers showed that the smaller size Class A units should replace at least 100 gallons of oil per season for every pound of coal-feed capacity per hour, and that the larger sizes should replace 100 gallons of oil per season for each pound of coal-feed capacity per hour up to 500 pounds per hour. Over that capacity the saving of oil should be approximately 50 gallons for every pound of feed-capacity. This would mean, for instance, that a 400-pound-per-hour stoker should replace at least 40,000 gallons of oil, while a 600-pound stoker should replace 55,000 gallons, and a 1,000-pound stoker should replace 75,000 gallons.

Oil Situation Grave

The oil situation continues to be grave, with planners plagued on one hand by a shortage-inspired need to conserve; on the other by the threat of uncomfortable homes and curtailed production by oil-fired war industries.

Late December developments included a rise in weekly coal shipments to New England, letting of contracts for the last 857-mile eastward left of the 24-inch War Emergency Pipeline, pleas for early settlement of differences between mine operators and labor unions, increases in ceiling price of fuel oil delivered to ration coupon holders, advancing of the date when third period coupons are valid in 30 states. These were followed by an order issued Jan. 2 reducing the value of oil coupons 10%. On January 6, fuel oil rations in the East were cut 25% to all but residential consumers.

Stoves Encouraged

A rationing program which aims to encourage rather than restrict buying, has been planned by the Fuel Rationing Division of OPA to facilitate the selective distribution of a large number of coal heating stoves. Fuel oil will thus be conserved through substitution of these coal heating stoves for oil-fired heaters.

WPB has taken following steps: (1) The weight and quantity restrictions on coal heaters under Order L-23-c have been completely lifted until January 31, 1943, and the manufacturers' iron and steel quotas have been increased 50% for the months of February and March, 1943; (2) Several thousand of the magazine type Army No. 1 heater have been released for civilian use; (3) Released additional stock piles of materials for the Army No. 1 heater, as well as several months productive capacity in the plants working under Army heater contracts.

The Emergency Heating Stove Rationing Program was formalized in Ration Order No. 9 and became effective December 18. Under its provisions, the retail sale of both new coal-fired heating stoves and new oil-fired heating stoves, except to the Army, Navy, Marine Corps, and Maritime Commission, will be restricted to those consumers who have been granted a certificate of purchase by their local Boards.

Furnace Production Halted

Limitation Order L-22a, issued December 15 to become effective December 31, halts all production of steel furnaces for direct-fired air heating systems except for urgent military needs.

Water Heaters Limited

Limitation Order L-185, issued December 19, adds gas fired and oil burning water heaters to the list of products which will be manufactured next year only for use in war housing or other war projects. Among the principal provisions of L-185 are the following:

1. Prohibits the manufacture of gas fired and oil fired water heaters except for war housing.

2. Prohibits the manufacture of solar water heaters.

3. Restricts the amount of metal used in the production of coal fired water heaters to the amount of metal used in the corresponding calendar quarter of 1941.

Instruments Controlled

Industrial thermometers, pressure gauges, control valves and other industrial type instruments were placed under control of the War Production Board December 24 by the Director General of Operations.

A-C Maintenance Studied

Maintenance problems of commercial refrigeration and air conditioning machinery will be studied by a special sub-committee of the Refrigeration and Air Conditioning Industry Advisory Committee, appointed at the December meeting of the Advisory group in Washington. Sterling Smith, General Industrial Equipment Division, was presiding officer.

The sub-committee will study three major problems of maintenance—manufacture of parts, distribution of parts, and manpower problems in installation of parts and repair of operating equipment. Members of the sub-committee are Marshall G. Munce, York Ice Machinery Company; A. B. Schellenberg, Alco Valve Co., and Frank S. McNeal, Universal Cooler Co. The sub-committee will report to the Industry Advisory committee at the next meeting, Jan. 13.

At the December meeting the committee recommended to WPB a revision of PD forms used to apply to WPB for permission to purchase new machinery. The single new form discussed is designed to replace this industry's use of six forms: PD-1a, PD-420, PD-616A, PD-615, one Treasury Procurement form and one Lend-Lease form. The information furnished on the new form would contain basic data required if appeal under orders M-9-c, M-126, L-100, L-163, L-172, and L-123 is necessary. The committee also discussed proposed changes in Limitation Order L-38, which restricts manufacture and sale of refrigerating and air conditioning equipment, and made recommendations to WPB for such amendment.

M-126 Amended

Further revision of the military exemption list of the Iron and Steel Conservation Order, M-126, was announced December 26 by the Director General for Operations. Among products appearing on the military exemption list for the first time are certain types of air conditioning equipment.

Amendment 1, lifting the ban on the use of steel for specified items, includes wheelbarrows for handling hot ashes, in order to encourage further conversion of industrial oil burners to the use of coal. Wire for rat-proofing refrigerator boxes is also permitted under the amendment.

DECEMBER WASHINGTON NEWS HIGHLIGHTS

Editor's Note: Supplementing its regular summary of Washington News, HEATING AND VENTILATING will publish a monthly index to press releases and other government-issued material of particular interest to those affiliated with heating, ventilating and air conditioning industries. Copies of releases or publications listed may be secured by writing U. S. Information Center, 1400 Pennsylvania Avenue, Washington, D. C. December releases follow, with the date of release preceding each. The number following each item is the release number.

20th OIL COUPON REDEMPTION DATES ADVANCED. Office of Price Administration. Abnormally cold weather in most of 17 Eastern states necessitates advancing date on which third period oil coupons become valid. OPA-1305.

20th IRON AND STEEL CONSERVATION ORDER AMENDED. War Production Board. Certain types of air conditioning equipment, which may now be manufactured of steel and stainless steel for military use, appear on the military exemption list accompanying a December 17 revision of Iron and Steel Conservation Order M-126. WPB-2274.

24th INDUSTRIAL INSTRUMENTS UNDER WPB CONTROL. War Production Board. Thermometers, pressure gages, control valves and other industrial type instruments are placed under WPB control by Limitation Order L-234. Issued December 24th. T-1463.

23rd COPPER CLAD STEEL SCRAP ALLOCATED. War Production Board. Brought under full allocation control by Copper Order M-9-b, amended. T-1459.

22nd FUEL OIL RATION UPPED FOR 13 STATES. Office of Price Administration. Rations in 13 middle western states increased from 10 to 11 gallons by adjusting coupon values to allow for abnormal temperatures. OPA-1352.

22nd REFRIGERATION MACHINERY UPKEEP STUDY. War Production Board. Maintenance problems of commercial refrigeration and air conditioning will be studied by a special sub-committee of the Refrigeration and Air Conditioning Industry Advisory Committee. T-1450.

22nd GRAY IRON CASTING REGULATION AMENDED. Office of Price Administration. Sellers of gray iron castings whose net sales during 1942 totalled $40,000 or less are excluded from price control in Amendment 2 to Regulation 244, effective December 26. Amendment also provides sellers an alternate method of establishing maximum prices for castings not sold during the base period, extends time for filing of pricing methods and cost records, and supplements the record-keeping requirements of the regulation. OPA-T-416.

21st WORK ON PIPELINE BEGUN IN PENNSYLVANIA. Petroleum Administration. Construction of 857-mile extension of 24-inch War Emergency Pipeline from Norris City, Illinois, to refineries at New York and Philadelphia started December 21st. OWI-951.

21st CONVERSION CONSTRUCTION DEADLINE EXTENDED. War Production Board. Present provisions that certain types of construction necessary to the conversion or substitution of heating equipment to permit use of fuel other than oil, electricity and gas may be undertaken without specific authorization are extended to January 1, 1944 by a supplement to Construction Conservation Order L-41-b. WPB-2262.

21st GAS, OIL WATER HEATERS LIMITED TO WAR PROJECTS. War Production Board. Gas fired and oil burning water heaters are added to the list of products which will be manufactured next year only for use in war housing and other war projects. Instructions embodied in Limitation Orders L-185 and L-199, which restrict production and limit amounts of metals and metal alloys that may be obtained by the industry in 1943. Schedules VII and IX of Order L-42 are revoked. WPB-2264.

21st DISTRICT OFFICES TO PROCESS STOKER REQUESTS. War Production Board. Due to the urgency of the oil conversion program, the Plumbing and Heating Division of WPB announced that applicants for Class A stokers in capacities under 1,200 pounds of coal per hour will be processed in WPB District Offices in Regions One, Two and Three, where the fuel oil situation is most critical. T-1459.

21st—PLUMBING SUPPLY FIRM, STORE BUILDER PENALIZED. War Production Board. T-1445.

21st—FUEL OIL RATION REGULATION MODIFIED. Office of Price Administration. Modification of fuel oil ration regulations to permit the consumption of fuel oil without a ration when the oil is brought into the 30-state rationed area in the supply tanks of locomotives, boats, trucks or other motor vehicles, is contained in Amendment 16 to Ration Order 11, effective December 26. OPA-1330.

21st—HARLAN STOKER COAL PRICE UPPED 65c. Office of Price Administration. OPA-1333.

21st—NEW HEATING STOVE RATION RULES ISSUED. Office of Price Administration. OPA-1348.

20th—PRIVATE CONVERSIONS TO GET HIGH PRIORITIES. National Housing Agency. OWI-983.

19th—HOMEOWNERS MAY ANTICIPATE ON FUEL COUPONS. Office of Price Administration. Homeowners who, by reason of special circumstances, have exhausted currently valid heating rations, can make arrangements with local War Price and Rationing Boards to buy fuel oil by using coupons valid for later periods. OPA-1340.

18th—COAL PROGRAM MAKING PROGRESS, SAYS ICKES. Solid Fuels Coordinator. Summarizing year's activities in coal production, Coordinator Ickes reported progress being made toward goal of stepping up 1943 soft coal production by 30,000,000 tons. OWI-956.

18th—TANK CAR OIL TO EAST DROP 30,959 BBLS DAILY. Petroleum Administrator for War. Total for week ending December 12 was 736,099 barrels daily, a drop of 30,959 below previous week. OWI-978.

18th—SOMERVELL URGES UTMOST OIL SAVINGS. Petroleum Administrator for War. Lieut. General Somervell urges all Americans to regard saving of oil as a patriotic contribution to the war effort. OWI-984.

18th—AVAILABLE OIL IN VARIOUS AREAS SET FORTH. Petroleum Administrator. Quantities of petroleum products available in various areas summarized. OWI-985. PAW-18.

17th—DOMESTIC COAL PRICE ESTABLISHED. Office of Price Administration. OPA-T-411.

17th—BITUMINOUS PRICE ORDER AMENDED. Office of Price Administration. OPA-T-406.

17th—MILLION FEWER NEW CONSTRUCTION WORKERS FOR 1943. Dept. of Labor. Key to new construction contemplated for 1943 given in Department of Labor report. OWI-947.

17th—"WAR PRODUCTION IN 1942" PAMPHLET ISSUED. War Production Board. Twenty page booklet summarizes war effort to date under headings, "The First Year," "The Major Problem," "Organizational Changes." WPB-2251.

15th—COAL AND OIL HEATING STOVES TO BE RATIONED. Office of Price Administration. OPA-1324.

15th—PLUMBING AND HEATING ORDERS AMENDED. War Production Board. To bring Orders into conformity with OPA rationing provisions, Limitation Order L-79 and Preference Rating Order P-84 are amended. T-1423.

15th—DIRECT-FIRED FURNACE PRODUCTION HALTED. War Production Board. Except for urgent military needs, all further production of steel furnaces for direct-fired air heating systems will be halted after December 31 under provisions of Supplementary General Limitation Order L-22a. T-1397.

15th—RELEASE ON REPAIR PARTS LIMITATIONS CORRECTED. War Production Board. The first paragraph of Release T-1396, December 14, is corrected to read, "The exemption of certain repair and maintenance parts from restrictions of the General Industrial Equipment Order, L-123, does not apply to spare parts for new equipment." T-1400.

15th—FUEL OIL RATIONING AMENDMENT RELEASED. Office of Price Administration. Amendment 15 to Ration Order 11 is made public. OPA-1318.

15th—TIGHTEN COASTAL COAL TRAFFIC CONTROL. Office of Defense Transportation. Preparing to meet any spot shortages of coal which may develop in New England, ODT Director Eastman tightened and extended controls on vessels operating in Atlantic Coastwise coal traffic, through General Order ODT-15, revised, and Suspension Order ODT, Revised 1, issued December 15. PM-4222.

14th—WAR HOUSING MANUAL AVAILABLE. War Production Board. Copies of a new "War Housing Manual" combining in handy form the rules and regulations governing this type of construction are now available at all field offices of WPB and FHA. It is free. WPB-2229.

14th—100,000 COAL STOVES RELEASED BY ARMY. War Production Board. WPB-2208.

12th—TANK CAR REGULATION REVISED. Office of Defense Transportation. To boost the rail movement of petroleum to the Atlantic Seaboard by at least 20 per cent, Director Joseph B. Eastman of the ODT, has tightened controls on the operation by revising regulations governing the assignment of tank cars, the loading and unloading by shippers, and the movement by carriers. General Order ODT 7, revised. PM-4217.

11th—ELECTRIC MOTOR ORDER AMENDED. War Production Board. To clarify possible misunderstandings regarding the deadline for deliveries of electric motors and generators, Order L-221 is amended. T-1366.

9th—BUILDERS' HARDWARE LINES CUT TO 3,500 ITEMS. War Production Board. Perhaps a forerunner of simplification to be applied to other lines is Schedule I of Order L-236, effective January 15, cutting builders' hardware lines from 27,000 items to a total of 3,500. WPB-2225.

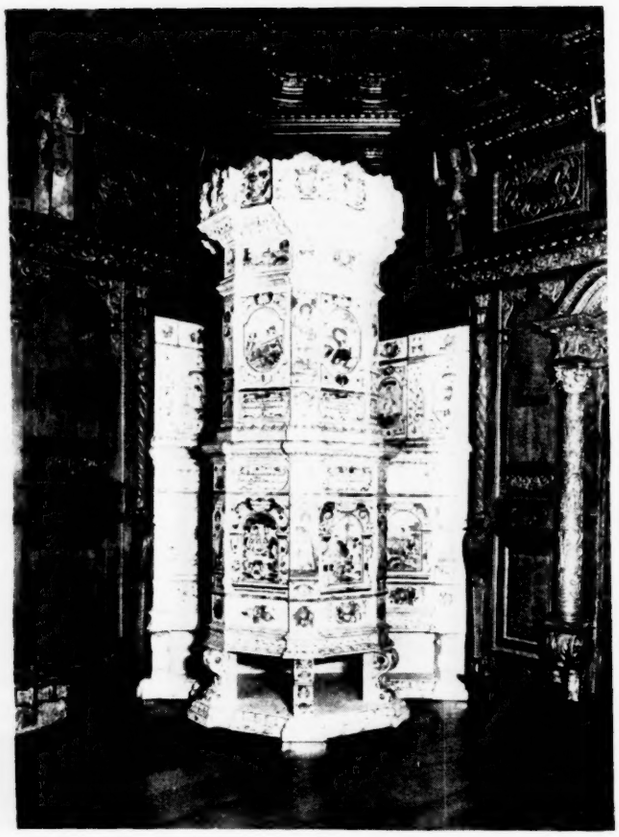
7th—RR OIL FREIGHT RATE ACTION PRAISED. Office of Price Administration. Railroads seeking to withdraw proposals for freight rate increases on petroleum, which would have boosted fuel oil bills an estimated $50,000,000 annually in Eastern states, drew commendation from Administrator Henderson. OPA-1262.

3rd—ROLLED ZINC REGULATIONS AMENDED. Office of Price Administration. Regulatory changes affecting rolled zinc products are announced in Amendment 1 to MPR 124, effective December 9. OPA-T-378.

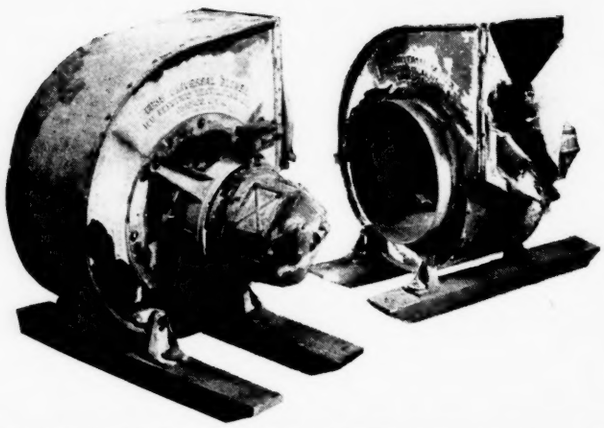
3rd—OSTBY IS NEW ENGLAND SOLID FUELS DEPUTY. Office, Solid Fuels Coordinator. Appointment of Oscar F. Ostby, New York City, as Assistant Deputy Coordinator of Solid Fuels for New England, is announced. He will headquarter at Boston. OWI-891.

3rd—REFRIGERATION ALLOCATION PLAN DEVELOPED. War Production Board. A plan developed by the Refrigeration and Air Conditioning Section to assist in determining the allocation of refrigeration facilities to retailers of perishable foods, was discussed at a meeting of the General Advisory Committee of the Industry. T-1319.

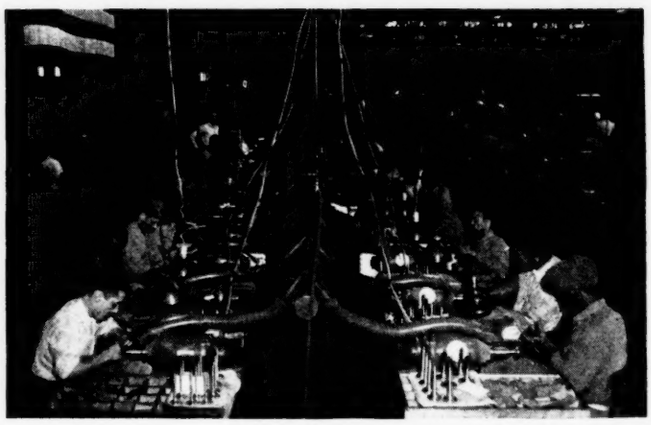
Picture Paragraphs



SEVENTEENTH-CENTURY SWISS STOVE. A beautiful tile stove in the Swiss Room of the Metropolitan Museum of Art. It was probably made by Ludwig Pfau II of Winterthur, a famous stove maker who died in 1683. The large panels on the hexagonal sides are painted with Biblical scenes.

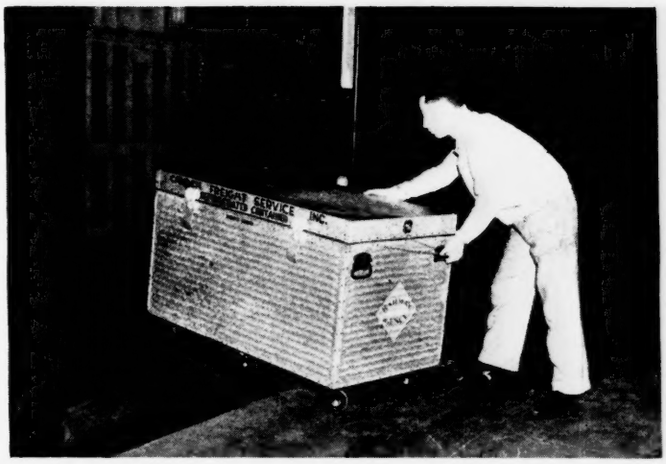


REFUGEES FROM TORPEDOED TANKER. These derelicts from the ocean bottom—two IIg direct-connected marine blowers—were recently returned to the IIg plant at Chicago for testing. Salvaged from a United Nations' tanker after long immersion in salt water, the blowers would still operate.

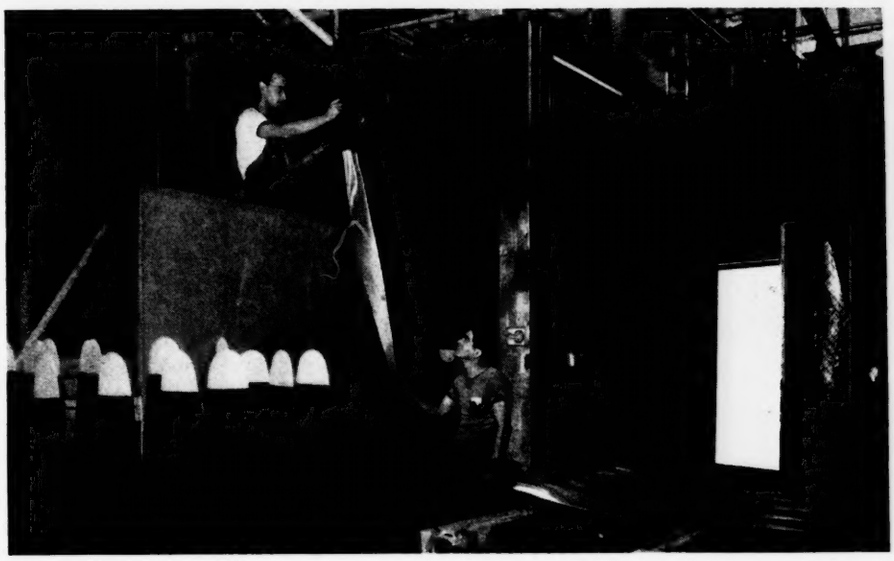


AIR CENTIPEDE. This odd arrangement of exhaust ducts in an Ohio aircraft products factory removes dust from a polishing operation. Through the 52 hoods 25,000 cfm are exhausted. Photo courtesy Compressed Air Institute.

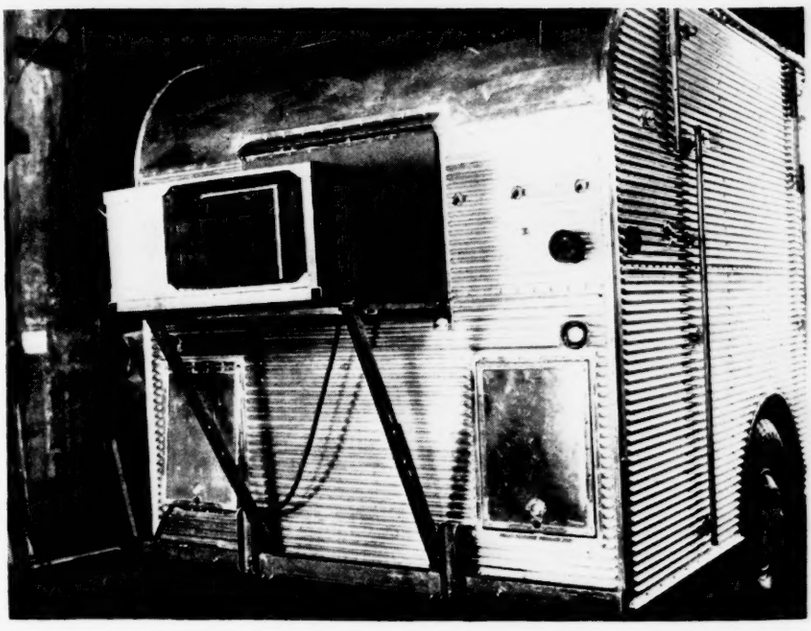
WARTIME WELDERS. At a leading Pittsburgh trade training center, the first women members in that city to take up welding as a wartime profession stand by while their instructor demonstrates the use of A. M. Byers Company's "welder's guide chart." The chart is part of Byers new industrial refresher course on the handling of wrought iron designed to speed production and assist the war effort.



REFRIGERATED BLOOD CONTAINER being used to carry blood from Red Cross collecting centers to laboratories where it is processed for shipment to the armed forces overseas. Designed by Major Elihu Church, built by refrigeration experts of the General Electric Company and transported by the Railway Express Agency, the containers hold 80 pint bottles. Left, bottles of blood being taken from a refrigerator and placed in an open container. Right, a closed container is pushed aboard an express car for shipment to a laboratory.



A BLADE A MINUTE. Endless chain conveyor at the Hamilton Standard Propellers Division of United Aircraft Corporation, East Hartford, Conn., carries airplane propeller blades through the 41-minute process of cleaning, painting and drying operations to turn out a finished yellow-tipped blade every minute. In the first chamber the blades are cleaned in hot trichlorethylene; next, the blades pass into a chamber where they are dried and cooled. In the third compartment they receive a priming coat, and next pass through a 160F drying chamber, and are then cooled by a stream of air.



AIR CONDITIONING GOES TO WAR. Carrier air conditioning units in U. S. Army photographic trailers to reduce the moisture content of the air and maintain temperatures that will permit efficient operation and production of photographic aerial films and prints. Successful use of this equipment has been made under desert operating conditions where temperatures ran as high as 120F.

Degree-Days for November, 1942

HEATING AND VENTILATING'S 15th year of publication of monthly degree-day data

City	Monthly Degree-Days			Cumulative Degree-Days			Year[1]
	Degree-Days, Nov., 1942	Degree-Days, Nov., 1941	Degree-Days, Nov., Normal	Season, 9/1/42-11/30/42	Season, 9/1/41-11/30/41	Season, Normal 9/1-11/30	Normal, 9/1-6/30
Abilene, Texas	240	306	333	365	394	333	2061
Albany, New York	799	683	774	1391	1246	1292	6580
Albuquerque, New Mexico	504	584	630	748	897	903	4298
Alpena, Michigan	857	778	912	1655	1446	1704	8299*
Anaconda, Montana	1061	885	951	1935	2100	1933	8357**
Asheville, North Carolina	514	540	576	836	689	852	4232
Atlanta, Georgia	335	373	396	453	417	492	2890
Atlantic City, New Jersey	454	422	588	690	615	842	5176
Augusta, Georgia	233	276	321	292	292	337	2161
Baker, Oregon	869	781	849	1547	1758	1659	7163
Baltimore, Maryland	484	393	567	683	535	790	4533
Billings, Montana	892	760	909	1576	1685	1622	7119
Binghamton, New York	752	623	798	1280	1101	1359	6808
Birmingham, Alabama	269	355	318	374	379	318	2352
Bismarck, North Dakota	1055	975	1113	1961	1856	1961	9192
Block Island, Rhode Island	579	487	573	948	831	852	5788
Boise, Idaho	759	688	738	1266	1345	1274	5552
Boston, Massachusetts	646	511	693	1037	899	1104	6045
Bozeman, Montana	1019	905	1006	1902	2068	1993	8521**
Buffalo, New York	739	640	774	1260	1095	1268	6822
Burlington, Vermont	863	771	861	1574	1533	1486	7514
Butte, Montana	1110	984	923	2148	2322	1922	8272
Cairo, Illinois	411	510	519	628	614	677	3909
Canton, New York	876	805	906	1567	1550	1652	8020
Charles City, Iowa	895	820	936	1599	1330	1505	7588
Charleston, South Carolina	154	175	0	183	175	0	1769
Charlotte, North Carolina	359	368	426	487	419	541	3120
Chattanooga, Tennessee	407	516	426	625	585	531	3118
Cheyenne, Wyoming	871	804	900	1745	1741	1745	7466
Chicago, Illinois	723	653	450	1285	970	800	5957
Cincinnati, Ohio	548	561	615	938	755	869	4684
Cleveland, Ohio	635	598	732	1066	958	1125	6155
Columbia, Missouri	531	580	651	914	806	911	4922
Columbia, South Carolina	258	275	324	317	292	355	2364
Columbus, Ohio	607	594	690	986	834	1003	5398
Concord, New Hampshire	851	751	846	1508	1486	1498	7353
Concordia, Kansas	648	634	693	1059	981	969	5315
Dallas, Texas	219	306	303	333	382	303	2256
Davenport, Iowa	726	671	795	1225	990	1158	6289
Dayton, Ohio	586	616	660	994	864	933	5264
Denver, Colorado	657	620	759	1233	1247	1259	5874
Des Moines, Iowa	738	692	798	1249	1057	1155	6384
Detroit, Michigan	717	661	777	1270	1051	1219	6490
Devils Lake, North Dakota	1159	1140	1179	2093	2132	2161	9970
Dodge City, Kansas	610	585	672	977	912	948	5035
Dubuque, Iowa	780	701	846	1379	1086	1291	6790
Duluth, Minnesota	1084	1001	1074	2021	1850	1970	9443
Eastport, Maine	839	771	843	1579	1597	1662	8520**
Elkins, West Virginia	643	685	741	1111	1040	1182	5697
El Paso, Texas	216	349	381	292	421	421	2428
Ely, Nevada	915	906	—	1801	2040	—	—
Erie, Pennsylvania	665	587	711	1100	943	1125	6273
Escanaba, Michigan	938	855	960	1787	1565	1794	8771*
Evansville, Indiana	509	598	528	881	771	683	4244
Fort Smith, Arkansas	340	429	408	499	517	470	3147
Fort Wayne, Indiana	700	708	726	1257	1085	1073	5925
Fort Worth, Texas	209	308	252	312	388	252	2148
Fresno, California	374	301	315	448	456	334	2334
Galveston, Texas	77	159	60	84	164	60	1016
Grand Junction, Colorado	679	713	747	1026	1224	1116	5548
Grand Rapids, Michigan	720	672	774	1297	1080	1250	6535
Green Bay, Wisconsin	898	795	921	1585	1321	1558	7825
Greensboro, North Carolina	476	498	492	699	617	635	3529
Greenville, South Carolina	363	371	450	499	412	596	3380
Harrisburg, Pennsylvania	637	557	660	979	823	989	5357
Hartford, Connecticut	703	596	705	1147	1043	1097	6036
Hatteras, North Carolina	199	208	234	228	237	234	2571
Havre, Montana	1090	853	1041	1864	1806	1931	8700**
Helena, Montana	1026	887	948	1872	2020	1813	7898**
Houston, Texas	121	183	114	146	207	114	1157
Huron, South Dakota	944	879	1005	1739	1498	1654	8004
Indianapolis, Indiana	582	581	687	981	795	985	5298
Ithaca, New York	750	641	786	1298	1150	1325	6719
Kansas City, Missouri	553	561	639	907	786	858	4956
Kewanee, Illinois	772	665	781	1337	952	1193	6139
Knoxville, Tennessee	415	506	519	660	588	702	3670
La Crosse, Wisconsin	861	762	909	1530	1262	1467	7322
Lander, Wyoming	1064	904	726	1921	1980	1656	7947

[1]Figures in this column are normal totals for a complete heating season, September to June, incl.

Figures in this table, with eight exceptions, based on local weather bureau reports. Exceptions are Utica, Lewiston, Kewanee, and Sioux City, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y.; Norman E. Ross, Bursar, Bates College, Lewiston, Me.; J. M. Hartman, Engineering Department, Kewanee Boiler Corp., Kewanee, Ill., and Alfred R. Wagstaff, Engineer, Sioux City Foundry and Boiler Co., Sioux City, Iowa, respectively; Anaconda, Bozeman, Butte and Livingston, Mont., through the courtesy of the Montana Power Company.

(a) Data not yet available.

[Table Concluded on Page 78

. 1 OF A SERIES

W TUBE-TURN
LDING FITTINGS
NEFIT WAR
INDUSTRY

The FIRST WELDING FITTINGS 1ST AND STILL THE BEST

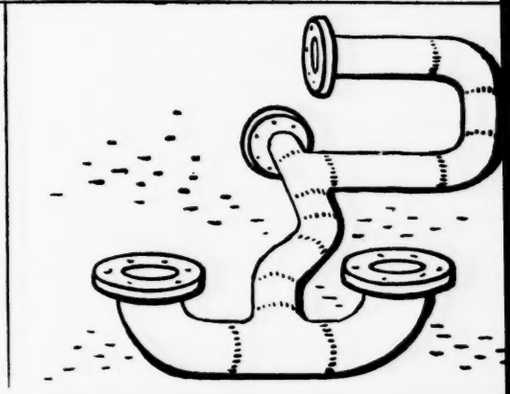
How Tube-Turn welding fittings speed-up piping installation for war production!

ER, FASTER, SAFER WELDING

rn fittings require only easy circumfer-
tt welds—which insure faster, better, safer
by both veteran and novice operators.

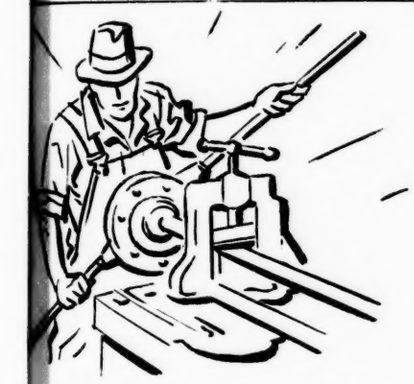
ALIGNING TIME GREATLY REDUCED

Tube-Turn fittings simplify lining-up operations —because their uniform wall thickness and true circularity permit quick alignment with pipe.



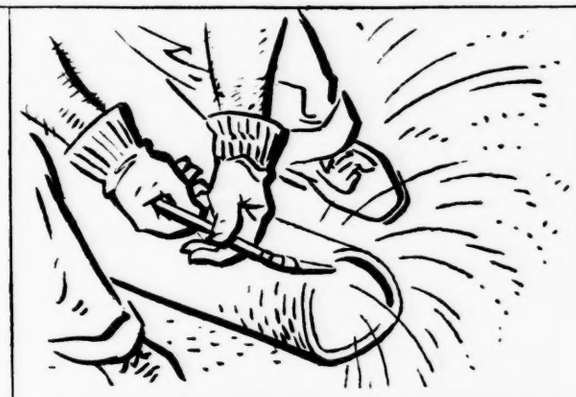
WHOLE SECTIONS CAN BE PRE-ASSEMBL

As Tube-Turn fittings and welded joints s
strain and save weight, piping sections can
welded on the ground to save time, then erec



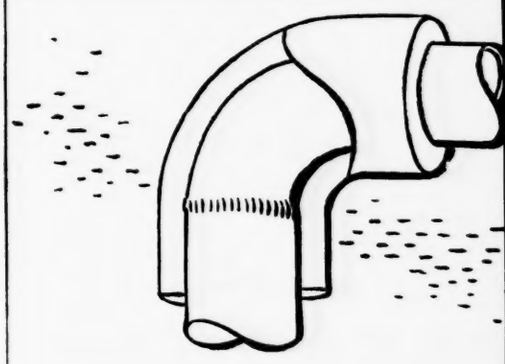
NO THREADS TO CUT

removes the inefficiencies of threaded
plus the labor and time applied to thread-
Tube-Turn fittings come ready to install.



NO TORCH CUTTING OR FABRICATION

Since all Tube-Turn fittings are installed with easy-to-make butt welds, they eliminate time-consuming, complicated cutting and fabricating.



FASTER AND EASIER TO INSULA

Tube-Turn fittings are insulated as readily as
pipe, for the welds form one continuous tube. E
inating many flanged joints shortens covering ti

ER FLANGED JOINTS SPEED ERECTION

ing fittings supplant the need for many of
flanged joints necessary in screwed piping,
materially reduces over-all erection time.

FEWER HANGERS OR SUPPORTS NEEDED

As welded piping weighs less and stands vibration better than flanged systems, the fewer hangers needed save installation time on these items.

**. . And you get stronger, leakpr
systems that virtually elimina
piping maintenance or failur
that can slow down or paraly
vital war industry!**

TUBE TURNS
INCORPORATED

Branch Offices: New York, Chicago, Philadelphia, Pittsburgh, Cleveland, Dayton, Washington, D. C., Tulsa, Houston, Los Angeles. *Distributors everywhere.*

UBE-TURN *Welding Fittings*
TRADE MARK

ARMY E

Degree-Days for November, 1942 (Concluded)

HEATING AND VENTILATING'S 15th year of publication of monthly degree-day data

City	Monthly Degree-Days			Cumulative Degree-Days			Year[1]
	Degree-Days, Nov., 1942	Degree-Days, Nov., 1941	Degree-Days, Nov., Normal	Season, 9/1/42-11/30/42	Season, 9/1/41-11/30/41	Season, Normal 9/1-11/30	Normal, 9/1-6/30
Lansing, Michigan	784	717	861	1466	1208	1456	7048
Lewiston, Maine	898	794	876	1600	1587	1542	7707
Lincoln, Nebraska	688	698	753	1166	1069	1069	5999
Little Rock, Arkansas	343	416	381	505	493	428	2811
Livingston, Montana	899	785	864	1770	1838	1614	7205
Los Angeles, California	106	74	123	145	149	123	1504
Louisville, Kentucky	483	522	552	798	658	738	4180
Lynchburg, Virginia	458	441	537	674	577	757	3980
Macon, Georgia	250	303	324	329	356	330	2201
Madison, Wisconsin	845	771	891	1490	1213	1437	7429
Marquette, Michigan	957	881	960	1793	1620	1752	8693*
Memphis, Tennessee	311	484	402	471	563	464	2950
Meridian, Mississippi	(a)	369	312	(a)	394	334	2160
Milwaukee, Wisconsin	780	751	846	1474	1244	1380	7245
Minneapolis, Minnesota	944	854	963	1683	1431	1537	7850
Modena, Utah	798	789	831	1418	1681	1504	6562
Montgomery, Alabama	217	268	273	267	278	273	1884
Nantucket, Massachusetts	584	496	609	959	883	1007	5957
Nashville, Tennessee	387	490	483	600	566	619	3507
New Haven, Connecticut	625	518	693	1001	862	1092	5895
New Orleans, Louisiana	101	173	102	123	178	102	1024
New York, New York	555	464	618	810	698	894	5347
Nome, Alaska‡	1131	979	1126	1706	1582	1870	14580**
Norfolk, Virginia	307	285	411	396	343	510	3350
Northfield, Vermont	939	825	969	1733	1699	1859	8719*
North Head, Washington	530	428	510	1078	933	1131	5452**
North Platte, Nebraska	779	722	837	1375	1257	1313	6366
Oakland, California	357	272	330	608	543	603	3143**
Oklahoma City, Oklahoma	397	446	459	605	601	564	3613
Omaha, Nebraska	727	743	780	1221	1133	1109	6131
Oswego, New York	752	655	783	1274	1180	1356	7088
Parkersburg, West Virginia	547	579	624	887	800	909	4775
Peoria, Illinois	707	655	789	1214	959	1173	6109
Philadelphia, Pennsylvania	515	439	588	760	613	830	4855
Phoenix, Arizona	77	119	156	95	153	156	1405
Pittsburgh, Pennsylvania	601	568	669	949	826	982	5235
Pocatello, Idaho	848	926	813	1468	1802	1468	6655
Portland, Maine	863	752	807	1559	1488	1446	7218
Portland, Oregon	558	470	558	843	854	995	4469
Providence, Rhode Island	640	554	693	1016	925	1104	6015
Pueblo, Colorado	662	688	741	1175	1232	1135	5514
Raleigh, North Carolina	360	348	429	508	405	559	3234
Rapid City, South Dakota	866	748	870	1632	1510	1529	7118
Reading, Pennsylvania	598	514	669	925	770	1013	5389
Redding, California	356	279	330	439	405	349	2451
Reno, Nevada	692	621	714	1251	1312	1311	5892
Richmond, Virginia	428	413	456	612	520	617	3695
Rochester, New York	(a)	653	786	(a)	1175	1289	6732
Roseburg, Oregon	(a)	448	561	(a)	910	1022	4428
Roswell, New Mexico	365	454	516	581	650	702	3484
Sacramento, California	349	283	351	422	422	422	2653
St. Joseph, Missouri	599	611	633	1004	903	881	5161
St. Louis, Missouri	492	531	597	805	705	802	4585
Salt Lake City, Utah	733	692	723	1225	1282	1129	5555
San Antonio, Texas	163	203	126	192	221	126	1202
San Diego, California	127	83	165	153	118	199	1645
Sandusky, Ohio	658	632	726	1099	935	1079	6208
San Francisco, California	271	200	261	560	429	521	3264**
Sault Ste. Marie, Michigan	1006	922	978	1930	1813	1877	9285**
Savannah, Georgia	135	139	201	157	139	201	1490
Scranton, Pennsylvania	705	610	732	1171	1016	1189	6129
Seattle, Washington	581	474	570	992	981	1150	4934**
Sheridan, Wyoming	959	814	978	1714	1796	1878	8008
Shreveport, Louisiana	204	347	270	285	393	270	1938
Sioux City, Iowa	864	789	870	1485	1276	1318	6898
Spokane, Washington	895	744	819	1472	1571	1526	6355
Springfield, Illinois	598	608	681	1007	839	963	5373
Springfield, Missouri	512	598	564	875	818	781	4428
Syracuse, New York	752	647	798	1318	1181	1319	6893
Tacoma, Washington	620	514	588	1090	1090	1195	5181**
Terre Haute, Indiana	565	575	615	950	784	848	4872
Toledo, Ohio	683	666	732	1195	1002	1110	6077
Topeka, Kansas	572	580	639	911	835	875	4969
Trenton, New Jersey	573	499	588	881	748	830	4933
Utica, New York	821	663	781	1418	1278	1393	6796
Valentine, Nebraska	863	806	897	1606	1454	1480	7039**
Walla Walla, Washington	716	568	651	991	1061	1013	4808
Washington, D. C.	504	438	594	716	591	845	4626
Wichita, Kansas	548	589	636	871	848	828	4673
Williston, North Dakota	1101	987	1137	2014	1946	2067	9323
Winnemucca, Nevada	753	695	810	1324	1520	1509	6427**
Yakima, Washington	(a)	659	780	(a)	1263	1337	5599

‡Nome data are for October.
*Includes August.
**Includes July and August.

[1]Figures in this column are normal totals for a complete heating season, September to June, incl.
(a) Data not yet available.

FOR OUR ARMED FORCES

INDUSTRIAL AMERICA HAS PLEDGED

ALL-OUT AND EVER-INCREASING PRODUCTION

FOR OUR ARMED FORCES

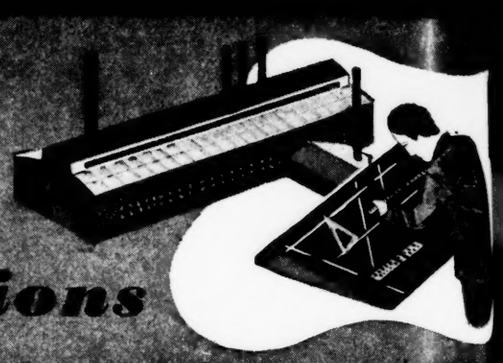
—THAT THEY MAY QUICKEN THE DAY OF VICTORY

—THAT THEY MAY RETURN IN SAFETY

—AND THAT THE WORLD MAY BE ASSURED

OF A LASTING PEACE

REVIEWS of TECHNICAL publications



AIR FLOW

"Measuring Air Flow in Industrial Ventilation," Preventive Engineering Series, Bulletin No. 3, Part 2. Published by Industrial Hygiene Foundation of America, Inc., Pittsburgh, Pa. Price, 75 cents.

This 6 by 9 in., 18-page pamphlet reviews the theory and explains the technique of air flow measurement. Includes rather complete discussions of the use of direct-reading instruments and the Pitot tube with its accessories. Sketches show various types of exhaust hoods used in industrial ventilating work, together with the recommended method of making readings of air movement through them, and for each type is given the proper entering coefficient. Tables of pipe areas, and of velocities corresponding to various velocity pressures, are included, to facilitate the direct conversion of Pitot tube readings to air volumes.

WATER HEATING STANDARD

"Proposed Commercial Standard for Testing and Rating Hand-Fired Water Heaters. TS-3362." By National Bureau of Standards, Washington, D. C.

In order to provide a uniform method of testing and rating the performance of hand-fired water heaters as a basis for fair competition among manufacturers and to assure adequate capacity to the purchaser by means of guarantee labels, this new standard has been drawn up for use in connection with heaters using solid fuels such as coke, coal or wood. Adopted by the preliminary conference, October 16, 1942, the standard has since been submitted for the consideration of producers, distributors and users of hand-fired water heaters.

CONVERSION GRATES

"Sources of Supply of Standard Replacement Grates," Bulletin L-42. Published by Anthracite Industries Laboratory, Primos, Pa.

This new 16-page, 6 x 9 in. bulletin, provides a source of grates for converting oil-fired boilers and furnaces to coal, and indicates those boilers and furnaces for which the manufacturer is prepared to supply parts. Names and addresses of nearly all manufacturers of heaters in the anthracite consuming territory are given, also of large supply houses and jobbers who stock grates. An accompanying 10-page pocket-size folder lists manufacturers of heating equipment approved by Anthracite Industries, Inc.

WAR HOUSING

"War Housing Manual," issued by Housing Branch Construction Bureau, War Production Board. Available from U. S. Government Printing Office, Washington, D. C.

This manual is intended to present in a general way a digest of procedures and requirements covering the filing and processing of applications for war housing, and to clarify procedures for those sponsoring, financing, constructing and furnishing materials for projects that qualify under the War Housing Program. A critical list of materials and products used in war housing construction is included.

AIR DISINFECTION

"The Effect of Humidity on Beta Streptococci (Group C) Atomized into Air," by W. F. Wells and Peter Zappasodi. Reprinted from Science, September 18, 1942.

In experiments and studies dealing with disinfection of atomized air-suspended microorganisms, confusing results often were noted until the lethal effects of humidity changes in exposure chambers were evaluated. High humidity neutralized and low humidity masked the disinfecting action of propylene glycol vapor, with disinfection being most apparent at intermediate humidities. This 4-page, 6 by 9 in. pamphlet gives tabulations covering seven series of experiments, representing comparable relative humidities, concentration of disinfectant and time of exposure. Results are reported in terms of lethes, a lethe being equivalent to the bacterial removal produced by one air change.

A related paper reprinted from Science, June 12, 1942, describes a quantitative vaporizer developed by Dr. Wells for the vaporization of propylene glycol in experimental studies of chemical disinfection of air. The device consists of a U-shaped glass tube containing a coiled electric immersion heating element.

CARBON MONOXIDE

"A Medical Study of Men Exposed to Measured Amounts of Carbon Monoxide in the Holland Tunnel for Thirteen Years." By Sievers, Edwards and Murray. Public Health Bulletin No. 278. Government Printing Office. Price, 15c.

Results of medical findings obtained in the examination of 156 traffic officers on duty at the Holland Tunnel for over 13 years. These officers were exposed to a carbon monoxide concentration averaging about 70 parts per million of air. Also included are findings resulting from examinations made after the same officers had been on duty for 5 years.

HERE IS DUST-STOP'S NEW "WAR" FILTER!

SQUARE GRILL of heavy Kraft cardboard replaces metal grill with round openings formerly used on Dust-Stop* Air Filters. Standard filter adhesive now used.

1 Quickly available

2 Price and maintenance economy the same

3 Filtering efficiency maintained

4 Saves critical metals and materials

BOMBER and tank plants, instrument manufacturers, scores of other war industries are using Dust-Stops in such great quantities that more of these filters were sold in 1942 than in any other year.

For dust control in precision manufacture means mechanical ventilation or air conditioning. And the makers of such equipment recognize the importance of Dust-Stops and include them in their systems.

Householders, too, have been using Dust-Stops in greater numbers than formerly. For clean filters help assure top efficiency from forced warm air furnaces—a big point with fuel rationing.

It was the responsibility of Dust-Stop engineers to meet this increased demand. They met it by designing a filter—the new "war" filter—which saves critical materials and keeps most of the advantages of the former Dust-Stop.

Most Advantages of the Leader in the Filter Field Remain Unchanged

Performance: Capacity, 2 CFM per sq. in. of area at 300 FPM. Average resistance, new, in inches of water gauge, .065 for 1-inch, .13 for 2-inch.

Economy: Cost only 1c per CFM as original equipment for industrial installations. Less than 1/10 of 1c per CFM to replace.

Maintenance: Filter face can be vacuum cleaned or rapped out, this practice can be repeated once or twice, further reducing maintenance costs.

Easy to Change: Anyone can replace dirty filters with new Dust-Stops in a jiffy.

Availability: Made from all-American materials which are not now listed as critical. Production is being expanded to meet growing requirements.

What about Fire-safety? The famous non-inflammable Dust-Stop adhesive is no longer available. As a substitute, standard filter adhesive are now used. The filter media is still made of incombustible glass fibers.

Owens-Corning Fiberglas Corporation, Toledo, Ohio. In Canada, Fiberglas Canada Ltd., Oshawa, Ontario.

FIBERGLAS* DUSTOP* AIR FILTERS

*T.M. Reg. U.S. Pat. Off.

NEWS OF THE MONTH

Seek High Btu Gas from Coal

LAFAYETTE, IND. — New and better methods of gas production are being sought in a long range research program at Purdue University. This program, under the sponsorship of the Indiana Gas Association, has already been under way for two years, during which the reactions of bituminous coals with hydrogen, particularly at temperature above 750F, have been studied. The investigation covered the gasification of coal in hydrogen and the complete hydrogenation of coal to gaseous products at high temperatures and pressures.

The present aims of the program are to lay the groundwork for completely transforming coal to a gas of high calorific value approximating natural gas in composition and burning characteristics. From an economic standpoint, the use of coal as a raw material for the production of gas will be advantageous because coal deposits are so widespread.

Although experimental work has not yet progressed to the pilot plant stage, much information has been obtained about the mechanism of the chemical processes involved. It has been possible to produce gases with a heating value of 900 Btu per cu ft.

Rationing Hurts Oil Dealers

BOSTON — Oil dealers of New England, especially the larger distributors, are hard hit financially because of oil rationing. No allowance has been made to compensate them for the enormous amount of bookkeeping and paper work needed to keep track of oil coupons and the filling out of the required ration forms, together with reports that have to be turned in periodically to the rationing board. The situation is so acute that Clyde Morrill, director of the Independent Oil Men's Association, has conferred with local officials of the OPA to see what can be done for relief.

One large distributor has a force of fifteen girls doing nothing else but keeping track of records and ration coupons. A time study showed that it takes a girl six minutes to go through the required procedure for each customer, which is a rate of about 400 customers in a 40-hour week. Distributors claim that the regulations on deliveries reduce the efficiency of these deliveries by one-third.

ASRE Elects Charles Logan

NEW YORK — Stratosphere fighter planes battling eight miles above the earth may soon become a reality through the aid of tests made in huge atmospheric chambers, according to J. G. Bergdoll, Jr., Chief Engineer of the York Ice Machinery Corp. In an address before the annual meeting of The American Society of Refrigerating Engineers, held here December 1-2, Mr. Bergdoll stated that steel strato-chambers are enabling the U. S. Army to simulate stratosphere temperatures and pressures which heretofore have been found only in actual flight.

According to the speaker, these test chambers demonstrated that at certain altitudes rubber becomes as brittle as glass and that pilots, when subjected to rapid increase in altitude, become victims of aero-embolism, the same condition which deep-sea divers call bends.

The York strato-chambers are steel cylinders approximately 22 ft long and divided into two chambers separated by an airtight steel door. The inner or climb chamber provides space for six men in flying clothes. In this chamber, the atmospheric pressure can be changed from that found at sea level, about 14 lb per sq in, to less than the 2 lb per sq in encountered at about nine miles above the earth. This, plus a drop in temperature from 70F to — 67F is accomplished in 12 minutes.

These chambers are also being used to test gas lines, rubber, metal parts, and practically every item going into a plane, for endurance under frigid stratosphere weather conditions.

Charles R. Logan, representative of the Superior Valve & Fittings Company, Pittsburgh, Pa., was elected president of the Society and was inducted into office at the closing session of the 38th annual meeting. Other new officers are: vice-president, A. B. Stickney, engineer, Armour & Company, Chicago; vice - president, John F. Stone, manager, Refrigeration Division, Johns-Manville Corp.

Directors elected by the A.S.R.E. to serve for a three-year period are: Charles S. Leopold, consulting engineer, Philadelphia, Pa.; Lee C. Leslie, Johns-Manville Corporation, Philadelphia, Pa.; Nels Rosberg, production manager, California Consumers' Corporation, Los Angeles; Arthur B. Schellenberg, president, Alco Valve Company, St. Louis; and J. Mack Tucker, University of Tennessee.

British Have Their Fuel Problems

NEW YORK—"British home fires are going to be kept burning only just so high in this critical winter of 1942," according to an article by Mollie Panter-Downes in the Dec. 12 issue of *Collier's*, in which Miss Downes writes amusingly if a bit wryly of the inconveniences due to fuel shortages in Britain.

According to Miss Downes:

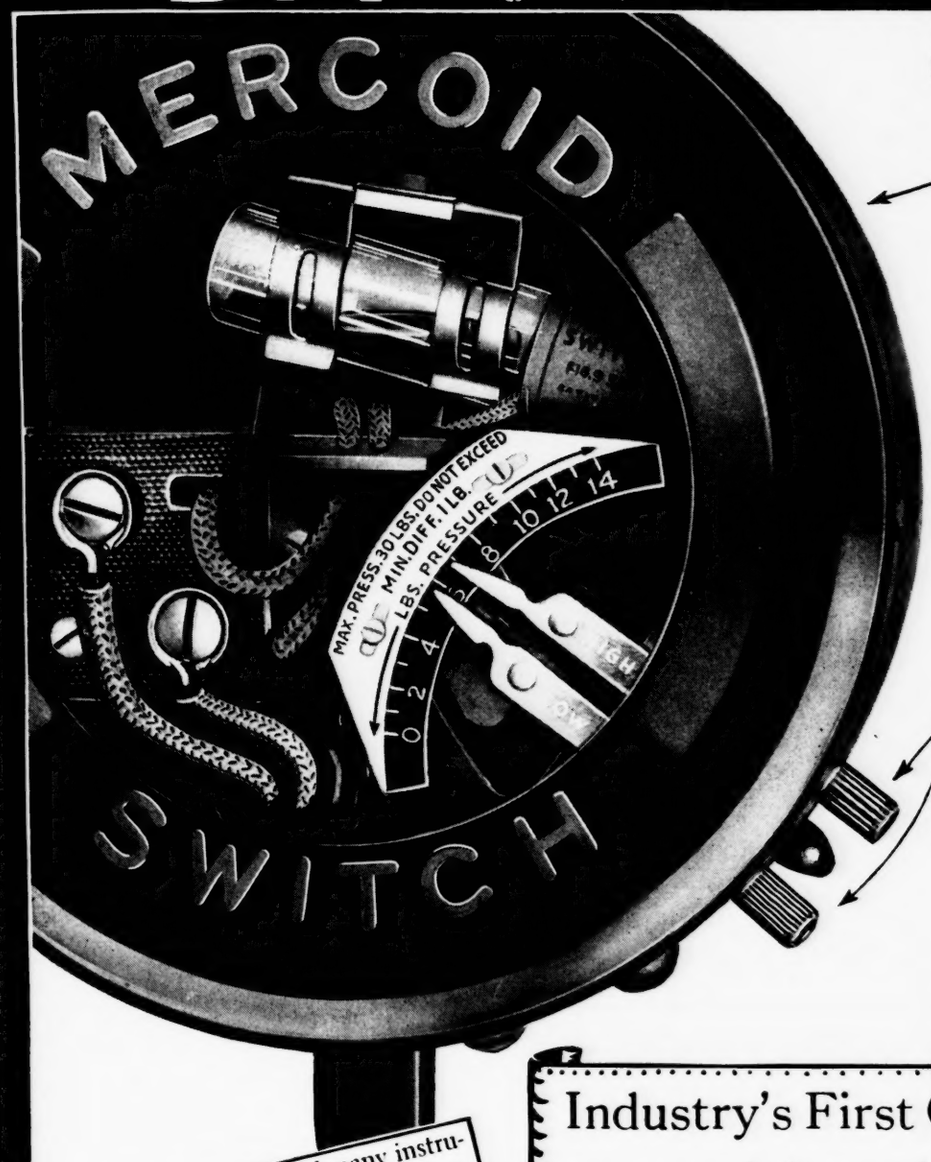
"The size of rooms wasn't taken into account by the Fuel Ministry when fixing the fuel 'target' that every household, according to its number of rooms and members, has been asked to stick to. The only discrimination which has been made is the different allowances fixed for people living in Scotland and northern England, the Midlands and the South, which all differ a good deal climatically. Northerners naturally get a higher percentage of fuel units credited to them than do householders in the Midlands, which Hilaire Belloc said were 'soggy and unkind,' but which nevertheless come off better again than the South, where disgruntled Britons imagine, from the slenderness of their allowance, that the Fuel Ministry visualizes them sitting around under their palm trees wreathed in hibiscus."

In discussing fuel conservation the authoress says:

"Another fuel-saving idea which is cracking what remains of the traditional English reserve is the new habit of spending alternate evenings with the people next door. Families are picking up their evening paper, mending and cat, and are going in to share the neighbors' fire, lights and radio. The authorities who first sponsored this idea point out anxiously that there's no need for hostesses to produce sandwiches and drinks for the guests, since this would create a situation which might be good for fuel but would be hard on shipping.

"The official dictum that patriotic British should now take only a small tub two or three times a week created a good deal of stir among the kind of well-scrubbed Englishmen who, according to classic formula, always dress for dinner in the jungle, until the publicity department cunningly released the news that all the Buckingham Palace bathtubs were now painted with a thin red Plimsoll line indicating the allowed five and a half inches hot-water level. Faced with this example, loyal subjects felt that there was nothing for them to do but buy a can of red enamel."

DA CONTROLS



NOTE THE FEATURES

The Mercoid mercury switch. Immune to dust, dirt and corrosion—a distinctive and exclusive feature in all Mercoid Controls. It provides an electrical contact designed for millions of perfect operations.

A Bourdon tube element actuates the switch. (Located back of cover, not visible on this photograph.) Long established as a dependable power element. A wide range of types to fit the service for which required.

Don't overlook this one. The outside double adjustment. Simple to set at desired operating points. Direct reading of setting eliminates calculations—an important factor considering the newly trained workers in all plants.

Industry's First Choice for accuracy and dependableness in temperature or pressure controls

The illustrated control is but one of many instruments developed and manufactured by Mercoid. Among others are Air Conditioning Controls ☆ Combination Pressure and Low Water ☆ Boiler Feed Water Pump Control ☆ Explosion-Proof Controls ☆ Float Controls ☆ Gas Pilot Control ☆ Industrial Type Liquid Level Control ☆ Lever Arm Control ☆ Oil Burner Controls ☆ Oven Temperature Controls ☆ Limit Controls ☆ Refrigeration Controls ☆ Transformer-Relays ☆ Stoker Controls ☆ Thermostats ☆ Unit Heater Controls ☆ Vapor Vacuum Controls ☆ Visaflame (Light operated Control) ☆ Mercury Switches.

If you have a control problem, let Mercoid engineers give you the benefit of their wide experience.

The Mercoid DA Control has attained universal use throughout industry.

Adaptable as it is to a wide range of applications and available in a variety of types, it is immediately considered wherever accurate control of pressure and temperature is necessary.

Many years of experience and engineering development are built into the Mercoid DA Control. It has become and will continue to be a symbol of instrument dependability.

NEW CATALOG IS IN PROCESS OF COMPLETION. YOUR REQUEST FOR A COPY NOW WILL RECEIVE FIRST CONSIDERATION.

MERCOID

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News of the Month

Connecticut Hit by Oil Shortage

HARTFORD, CONN.—Governor Robert A. Hurley, acting under a state law passed during the first world war, declared on Dec. 26 that a state of emergency exists in the fuel-oil situation in Connecticut.

This action was taken upon the petition of Mayors and First Selectmen of fifty Connecticut towns of more than 5,000 population each, who told the Governor that the fuel situation is critical in all of their communities; that only 2 per cent of the private homes had converted from oil to coal heating systems, and only half of the commercial and public buildings had done so. They attributed this failure to the scarcity of materials for conversion, to the cost and to lack of accurate information regarding fuel and coal supplies.

The town executives said that so far there had been little suffering from the fuel-oil shortage, but predicted suffering would become widespread unless a concrete program is put into effect to control the equitable distribution of the available supplies of oil.

A suggestion has been made that the public schools be closed during January and February instead of July and August, as a fuel conservation measure, but a decision on this has been postponed for the present.

The emergency law passed by the State Legislature in 1917 was one of the most far-reaching on the statute books. It empowered the Governor, in time of war, to do almost anything he deemed necessary for the successful prosecution of the war and the defense of the state. The Governor was authorized to aid the President in any way the Chief Executive required; to provide for the public safety and to employ the resources of the state in men, property and instrumentalities "as he may judge most expedient."

Ventilators Help British

RICHMOND, VA.—Mechanical ventilators for factory use during blackout in England have overcome the spreading of infectious diseases, Dr. Edward Rowland Alworth Merewether, senior medical inspector of factories for the British Ministry of Labor and National Service, told Richmond doctors and industrial representatives in a talk here. He spoke under auspices of the health division of the Richmond Community Council. Dr. Merewether cited the increase in pulmonary tuberculosis, particularly in young women, in Britain during wartime.

Gas Heat for Defense Houses

NEW YORK—In a year-end review of accomplishments of the gas industry during 1942, AGA president Arthur F. Bridge, vice-president and general manager, Southern Counties Gas Company, Los Angeles, stated that 1942 revenues of natural and manufactured gas utilities were 8.9% over those of 1941.

In the household uses of gas, such as cooking, refrigeration, house heating and water heating, Mr. Bridge said that manufactured gas companies sold 283,900,000,000 cubic feet, a gain of 6.7% for the year. Gas consumed for house heating registered an increase of 17.3%. Sales of natural gas for domestic uses registered an increase of 13.3%—bringing the sale for that purpose to 479,274,000,000 cubic feet.

Gas for house heating ranks second (coal and coke combined rank first) among the nation's fuels, he added, as the Census further discloses that 3,122,577 homes in urban territories reported the use of gas for heating purposes as against 2,260,556 using oil. The American Gas Association's study further indicates that 59% of the new homes constructed in 1941, covered in an AGA survey, report the choice of gas for house heating.

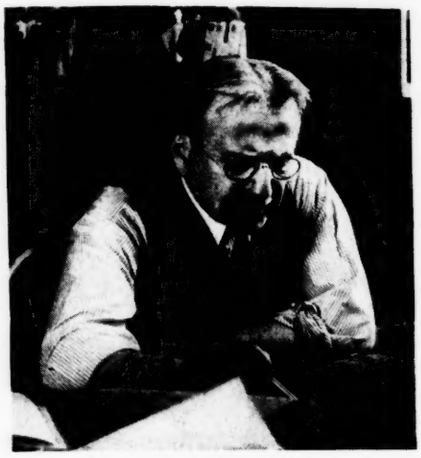
Gas is also a preferred fuel in the defense housing projects sponsored by the various governmental agencies, Mr. Bridge said. A recapitulation of 325 such projects constructed as of December 1, 1942, shows that gas is used by 85% for cooking, 81% for water heating, and 36% for space heating.

Charles L. Crouse

JOHNSTOWN, PA.—Charles Leslie Crouse, 56, vice-president of the National Radiator Company, died Dec. 12, at Memorial Hospital here. Death occurred on the 26th anniversary of his marriage and just five days after he had been paid high tribute by fellow employees of the radiator firm on the 35th anniversary of his affiliation with the company.

Mr. Crouse had served as vice-president of National Radiator for the past 15 years and had been general manager of sales for the last 12 years. Since 1938 he had been a director of the present company.

In 1907 he entered the employ of the National Radiator Company under John H. Waters and worked in the accounting office, sales office and branch offices of the firm before reaching the position of vice-president.



Albert Kahn

DETROIT—Albert Kahn, internationally famed industrial architect and engineer, frequently referred to as the man who built Detroit," died at his home here Dec. 8 at the age of 73.

At his death Mr. Kahn was in the midst of the greatest program that even he had ever undertaken. His office had been responsible for such recent plants as Dodge—reputed to be the largest plant in the world—plant now under construction in Chicago; the Ford Bomber Plant; numerous Wright Aeronautical and Curtiss-Wright plants; Glenn L. Martin plants; Pratt andWhitney plants; the Chrysler Tank Arsenal; and many others. He had previously been chosen by the Bureau of Yards and Docks to design Naval bases.

Beginning in 1928 and continuing through the thirties Mr. Kahn's organization designed 521 factories for Soviet Russia and trained some 4,000 Soviet engineers to operate them.

A catalog of the buildings designed by Albert Kahn runs to astonishing figures of more than 1,000 factory buildings for Henry Ford alone, and 127 major buildings for General Motors. In four decades his firm supervised the building of two billion dollars worth of industrial structures.

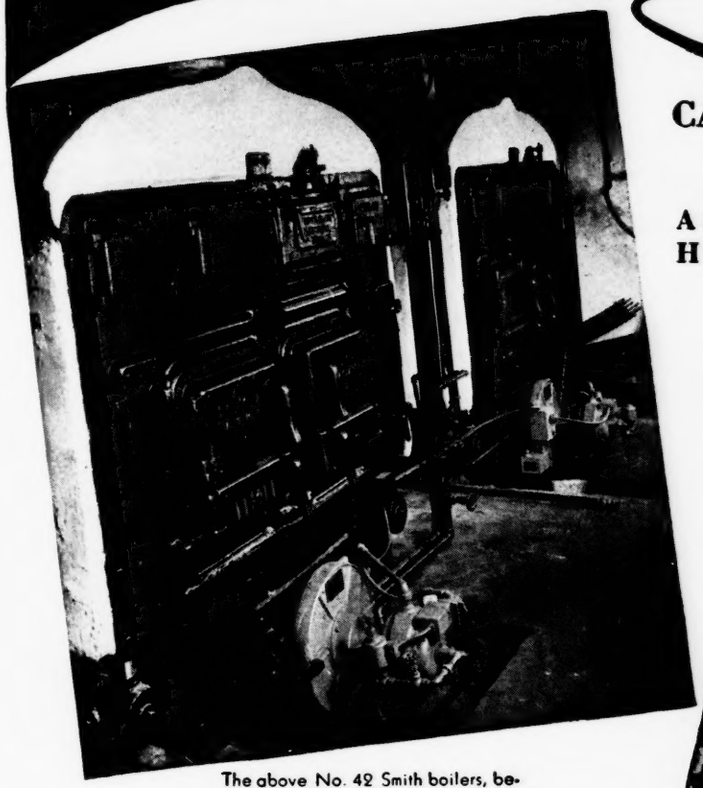
Mr. Kahn was born in Rhaunen, Germany, in 1869 and came to America at the age of 11 and began as an errand boy in an architect's office. Several years ago 25 architects and engineers in his organization became partners in the firm and the organization henceforth became known as Albert Kahn Associated Architects and Engineers, Inc. These 25 partners include specialists in almost every field of industrial architecture and engineering. The organization at present numbers over 600.

Mr. Kahn will be succeeded as head of the firm by his brother, Louis Kahn.

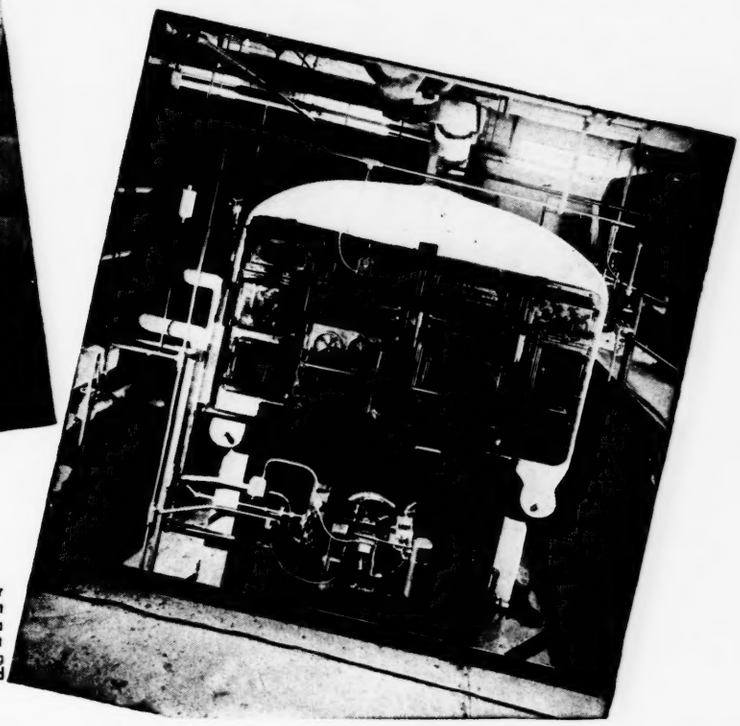
Why H. B. Smith

CAST IRON - LOW PRESSURE BOILERS

ARE ANSWERING INDUSTRY'S HEATING REQUIREMENTS



The above No. 42 Smith boilers, besides handling heating requirements, supply steam at 10 lbs. pressure to a degreasing machine.



This No. 60 Smith boiler, together with another unit of equal size, not only supplies steam for heating in a Massachusetts industrial plant, but handles a large air conditioning load, as well as process steam and service hot water.

1. Designed for Continuous Operation

H. B. Smith large boilers are *independent header* type sectional boilers. Each section is in reality an individual boiler which is connected to supply and return headers. Should some accident, such as low water, cause a section to break, it may be disconnected in a few minutes' time, *without interruption of service* and may then be replaced when convenient.

2. Unusual Flexibility of Operation

The larger size H. B. Smith boilers are of vertical water tube design. Many comparatively small vertical waterways assure rapid water circulation and fast steaming. This flexibility of operation is particularly to be desired on installations where the system itself requires flexibility of performance.

3. Adaptable to All Types of Fuels

Smith boilers are adaptable to all types of fuels. Hand fired and automatically fired solid fuels, oil or gas may be used. It is always possible to convert these boilers from one fuel to another, if conditions make it advisable.

4. Lowest Maintenance Cost

Engineers acknowledge that over a term of years, good cast iron boilers have the lowest maintenance expense—a belief that is securely backed by both statistics and case histories.

5. Sectional Boilers Easily Enlarged for Plant Expansion

H. B. Smith boilers are sectional boilers and may, therefore, be enlarged by adding sections to handle additional heating requirements. In this day of rapid plant expansions, many engineers are giving great consideration to this useful feature of Smith boilers.

6. Recognized by Engineers for High Efficiency

H. B. Smith boilers are constructed with plenty of heating surface—a high proportion of it direct—in order that heat may be absorbed by the boiler once it has been generated in the combustion chamber. This fact, together with long down draft flue travel is responsible for the high efficiency and economy of operation so characteristic of Smith boilers, and for their wide acceptance by heating engineers.

7. Rated for 40 Years' Service

Smith boilers are built of rugged grey iron castings—the finest and most satisfactory metal for boiler construction. Cast iron takes punishment as no other metal will. The United States Housing Authority and Federal Works Agency recognize the longevity of cast iron boilers by recommending their amortization over a 40-year period. Many H. B. Smith boilers have given uninterrupted service for over 50 years.

8. Cast Iron Resists Corrosion from Water and Fuels

An industrial engineer who recently selected two large cast iron H. B. Smith boilers for a factory installation gave as one of his reasons that he required "boilers which would develop a high overall efficiency when fired with Bunker 'C' oil, would give a maximum length of service with no retubing or other maintenace costs, and were constructed of a material that would not be eaten away by the acid formed by the sulphur contained in heavy oils."

9. Cast Iron Boilers for Replacements

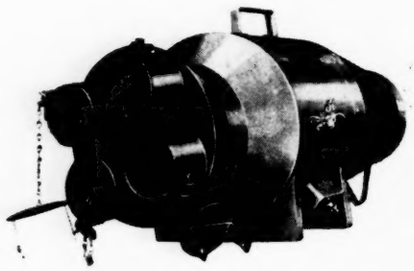
Where obsolete or broken boilers are to be replaced, it is always easier to replace with a cast iron boiler because the sections can be carried through existing doors and hatchways. There is no need to tear down half a wall to deliver the boiler in the boiler room.

WRITE FOR COMPLETE INFORMATION

THE H. B. SMITH CO., INC., WESTFIELD, MASS.

BOSTON NEW YORK PHILADELPHIA

NEW EQUIPMENT

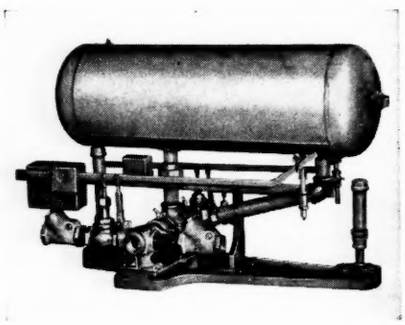


Portable Exhauster

NAME—The Octopus, Jr.
PURPOSE—For exhausting gases and fumes from ship holds, welding rooms, tunnels, basements, and other closed-in places.
FEATURES—Consists of a direct connected blower unit mounted on steel wheels, with a special blower inlet adapter piece equipped with either three 4-in., or four 3-in., flexible suction hose connections. Unit operates in any position, weighs but 70 lbs. and can be hung in a small manhole. Manufacturer will ship one on approval to anyone doing war work.
SIZES AND CAPACITIES—Sucks or blows 2000 cfm. Powered by a ¾ hp ball-bearing motor.
MADE BY—*Chelsea Fan & Blower Co., 1206 Grove St., Irvington, N. J.*

Tilt Trap

NAME—Three-Valve Tilt Trap.
PURPOSE—For boiler feeding, and for draining and deaerating steam equipment.
FEATURES—Built to withstand 250 lb operating pressure, and to handle condensates and make-up water at temperatures of 212F and higher without pumps or other mechanisms. All water fed to boiler through the system is deaerated. A large welded galvanized steel storage tank, resting on bearings centrally located so as to eliminate the possibility of straining the trunnion and packing boxes, provides necessary capacity. Trunnion and steam and water ends are of extra heavy bronze. Tank bears certified A. S. M. E. label.
LITERATURE AVAILABLE — Data Unit 2-E41.
MADE BY—*W. M. Acker Organization, Inc., 3176 Fulton Rd., Cleveland, O.*



Solenoids

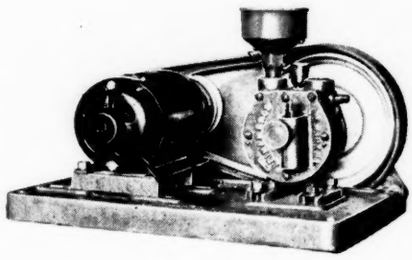
NAME—Davis-Made laminated solenoids.
PURPOSE—For straight-line magnetic thrust action, particularly for the operation of hydraulic valves and for other general industrial applications.
FEATURES—Small, compact frame sizes, and a high ratio of work done per watt input, are claimed for these two new solenoids. Pressure-riveted laminated frames and plunger, and phosphor bronze plunger guides, together with precision manufacture, insure quiet operation. Coils may be paper-section wound, cloth-taped, and treated with special synthetic resins to render them impervious to cutting oils or coolant, and to give good protection against short circuiting. Available in either pull or push-pull type.
SIZES AND CAPACITIES—0 to 4.5 inch lbs torque. Maximum stroke ⅞ in. Can be had in any voltage and in 25 to 60 cycles. Performance figures based on 110 volts, 60 cycles, 1-inch stack solenoid.
MADE BY—*Dean W. Davis & Company, Inc., 549 W. Fulton St., Chicago, Ill.*

Coolant Pumps

NAME—I-R coolant and circulating pumps.
PURPOSE—For circulation of machinery cutting or cooling fluids, and for circulating water in evaporative condensers, air conditioning units and air washers.
FEATURES—These new machines are additions to the line of coolant pumps previously available. They include ¾ and 1 in. side-wall-mounted type, a 1¼ in. side-wall-mounted type for low submergence applications, and a 1¼ in. horizontal type.
LITERATURE AVAILABLE—Bulletin 7074, 20 pages, gives full description, performance tables, curves, cross-section and dimensions. Covers capacity range of 5 to 150 gpm for heads up to 125 ft.
MADE BY—*Ingersoll-Rand Co., 11 Broadway, New York, N. Y.*

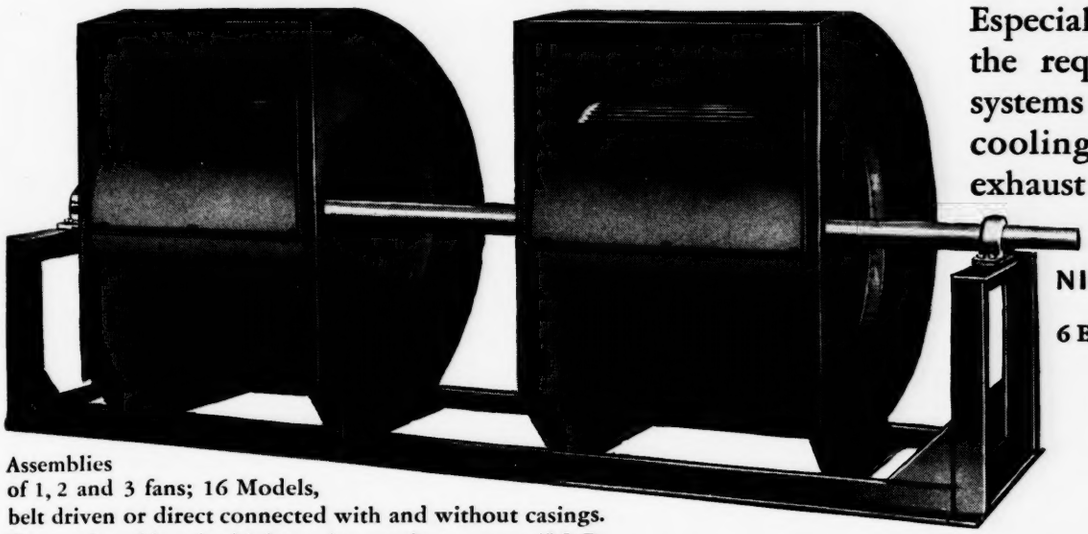
Vacuum Pump

NAME—Leiman Vacuum Pump.
PURPOSE—For converting existing gravity steam heating systems to vacuum.
FEATURES—Consists of a motor-driven vacuum pump automatically controlled with a relief valve, air gage and automatic lubricator, all ready to attach to an existing steam system. Present system must first be equipped with automatic float type water trap and water return line to the boiler. Positive freedom from air troubles in the system is claimed by the manufacturer.
SIZES AND CAPACITIES—Various sizes, smallest being rated up to 4500 sq ft EDR.
MADE BY—*Leiman Bros., Inc., PB-146 Christie St., Newark, N. J.*



NIAGARA *Industrial* MOTOR BLOWERS

for VENTILATING, DRYING, EXHAUSTING FUMES *and* LIGHT DUST, HEATING, COOLING, RE-CIRCULATING



Assemblies
of 1, 2 and 3 fans; 16 Models,
belt driven or direct connected with and without casings.
Two series of fans for highest air capacity—up to 4" S. P.

Especially designed to meet the requirements of duct systems in blast heating or cooling or in industrial exhaust systems.

Write for Bulletin 89

NIAGARA BLOWER CO.
Dept. HV-13
6 E. 45th St. New York City
37 W. Van Buren Street, Chicago, Illinois
Fourth & Cherry Bldg., Seattle, Wash.
673 Ontario Street, Buffalo, New York

District Engineers In Principal Cities

NIAGARA INDUSTRIAL COOLING • HEATING • DRYING HUMIDIFYING • AIR ENGINEERING EQUIPMENT

Carey HEAT INSULATIONS AIDING FUEL CONSERVATION IN IMPORTANT PUBLIC CONSTRUCTION

Insulation Contractor:
T. G. EGAN
Refractory Engrg. Co.
Brooklyn, N. Y.

THE new Post Office at Charleston, W. Va., is representative of the many public buildings throughout the nation in which CAREY Insulations are used to conserve the vital national resource—FUEL. Carey Insulations, by their high resistance to the passage of heat and their exceptional impact strength, offer top efficiency combined with permanence—an essential factor in fuel conservation that quickly returns its cost in savings, usually in a year or less.

Through constant scientific research, Carey Insulations have kept pace with heating progress—met every new demand—every service requirement. Over a half century of manufacturing experience and a nationwide engineering and service organization are back of their outstanding performance.

Whatever your insulation needs, specify CAREY for maximum economy and lasting satisfaction. For details, address Dept. 49.

THE PHILIP CAREY MFG. COMPANY
DEPENDABLE PRODUCTS SINCE 1873
LOCKLAND, CINCINNATI, OHIO
IN CANADA: THE PHILIP CAREY COMPANY, LTD
OFFICE AND FACTORY
LENNOXVILLE, P.Q

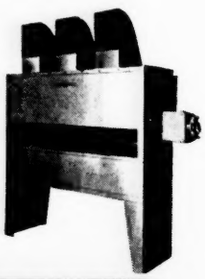
For Army-Navy Projects and War Industries

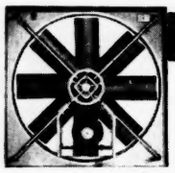
At this time The Herman Nelson Corporation is busy furnishing Heating, Ventilating and Air Conditioning Equipment for use everywhere in connection with work vital to our National War Effort. However, The Herman Nelson Corporation is maintaining Sales and Service Offices in all Principal Cities in order to help facilitate war work. Each office is equipped to quote and aid in working out details for your war project.

HERMAN NELSON hijet HEATERS

Horizontal Shaft Propeller-Fan Type hijet Heater projects warm air downward in the desired direction. Eliminates waste fuel and space. Available in 48 models, sizes and arrangements.

Herman Nelson Blower-Fan Type hijet Heater provides efficient heating of large areas. Streamline discharge outlets maintain large air delivery with high velocity. For floor, wall, ceiling, or inverted wall mounting. Available in 150 models, sizes and arrangements with a wide range of capacities.

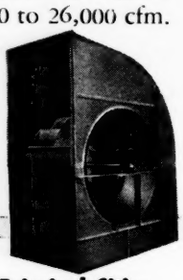




AUTOVENT FANS AND BLOWERS

Autovent Propeller Fan. Exclusive Autovent design—direct or belt driven. Ruggedly constructed for economical operation under severe conditions. Available in wheel diameters from 9 to 54 inches; capacities 450 to 26,000 cfm.

Autovent Blower for heavy duty ventilating and air conditioning installations. This Blower can be furnished to any speed or discharge requirements, in a wide range of sizes.



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Emporia, Kans.	New Orleans, La.	Tulsa, Okla.
Fort Wayne, Ind.	New York City, N. Y.	Washington, D. C.
Grand Rapids, Mich.	Norfolk, Va.	Watervliet, N. Y.
Houston, Texas	Omaha, Neb.	Westfield, Mass.

THE HERMAN NELSON CORPORATION, MOLINE, ILLINOIS

Autovent Fan & Blower Division, Chicago, Illinois

Manufacturers of Quality Heating, Ventilating and Air Conditioning Products

WHAT READERS SAY

AIR CONDITIONING AND LIGHTING

EDITOR, HEATING AND VENTILATING:

On page 38 of Reference Section No. 7 appearing in the November issue of HEATING AND VENTILATING, the constant 1.08 appearing in the denominator of the formula for calculating the temperature rise due to heat input in a closed interior is in error. This constant combines the specific heat of air and the specific weight of air and should have been stated as .018. This error occurred during the transposition from penciled notes to final manuscript and, in spite of careful reading by many authorities, went undetected due possibly to the fact that the constant 1.08 occurs frequently in air conditioning calculations when air change is computed in feet per minute. The example quoted is on an hourly basis, however.

Fortunately the enormous increase in theoretical temperature rise resulting from the application of the correct constant does not alter the text but serves rather to make more dramatic the difference between theoretical changes and actual changes in the interior being discussed.

Howard M. Sharp, Manager
Appliance and Lighting Bureau,
Buffalo, Niagara and Eastern Power
Buffalo, N. Y. *Corporation*

FUEL OIL WASTE CHART

EDITOR, HEATING AND VENTILATING:

In the December issue of HEATING AND VENTILATING, page 25, appears our chart for estimating fuel oil wasted by inefficient furnaces operating with clean fires.

. . . The note at the bottom . . . should read "Chart for estimating fuel oil wasted by inefficient boilers and furnaces operating with clean fires, as compared to 80% efficiency. This chart includes an allowance of 7% for hydrogen moisture loss and 5% for radiation and unaccounted for losses."

This correction is important because in actual practice more oil is wasted by clean fires than by smoky fires. Let me point out that our chart applies only to clean fires, regardless of the CO_2 content. Most people recognize smoky fires as wasteful, but few realize that clean fires may be even more wasteful.

William S. Hobbs
Engineering Div., Mfg. Dept.,
Philadelphia, Pa. *Sun Oil Company*

PERSONALS AND PERSONNEL

JAMES M. HAIT

chief engineer, Peerless Pump Division, Food Machinery Corp., has been made general manager of a newly-created division of the Corporation—Division of Procurement and Engineering.

JOHN H. ROMANN

chief metallurgist of Tube Turns, Louisville, Ky., has been appointed chairman of a committee to conduct a special nation-wide investigation in industrial plants concerning the low temperature properties of metals. This research is being carried on for the War Department by the War Metallurgy Committee of the National Research Council, National Academy of Sciences. Mr. Romann has been granted an indefinite leave of absence from Tube Turns in order to direct this work.

WILLIAM B. HENDERSON

executive vice-president of the Air Conditioning and Refrigerating Machinery Association, has been given a temporary leave of absence. He has been ordered to immediate active duty as a lieutenant in the Naval Reserve. During Mr. Henderson's absence, Mary Jane Stewart, who has collaborated with him in Association operation for the past ten years, will serve as ACRMA executive officer.

J. EARLE MAYNARD

has been appointed director of engineering of The Rybolt Heater Company of Ashland, Ohio, effective January 1.

WITH THE MANUFACTURERS

WARREN WEBSTER & COMPANY

was awarded the Army-Navy E at presentation ceremonies held at the Webster plant January 5. The company converted to war production in the spring of 1940 and is now producing ten times the originally contemplated maximum as a result of streamlining production and the breaking down of jobs into smaller jobs.

THE FULTON SYLPHON CO.

has been awarded the Army-Navy E with added star for sustained high achievement in the production of war equipment, including ordnance, aircraft parts, vehicular parts, and materials for the Navy, Merchant Marine, and other war industries.

BUFFALO FORGE CO.

was awarded the Army-Navy E at ceremonies held Dec. 7, at the Kleinhans Music Hall, Buffalo. Presentation was made by Rear Admiral Wat T. Cluverius, U. S. Navy, Retired, and was accepted by Henry W. Wendt, chairman, and Edgar F. Wendt, president of the Buffalo Forge Company.

Col. John M. McDowell presented employees "E" pins. Accepting them, on behalf of the more than 1500 employees, were John Giertz, Edgar L. Uhl and Don R. Marsh. Buffalo Pumps, Incorporated, a subsidiary company, received the Army-Navy award Sept. 3 and is supplying marine service pumps for the Navy and Merchant Marine, as well as general and special pumps for industrial applications.

STOP CORROSION
in your steam and condensate lines
WITH CORAVOL

The metal of your steam system is precious. Protect it with CORAVOL.

CORAVOL is a volatile and condensible treatment for steam systems. It circulates continuously throughout the steam-condensate circuit, neutralizing acidity caused by carbon dioxide and maintaining the alkaline condition which prevents corrosion. It reaches and protects those parts of the system — steam lines, valves, traps, radiators, condensate return lines—not otherwise accessible. CORAVOL cleans out old rust deposits, increasing heating and operating efficiency. This patented process has been in practical, successful use for over six years. Now more than ever — since replacements are difficult or impossible to obtain — CORAVOL is needed to protect the metal and reduce operating and maintenance costs.

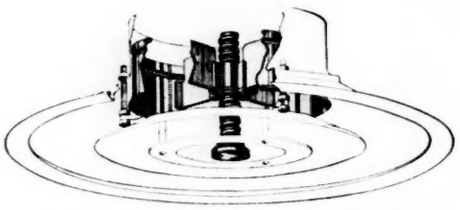
Write for full information

WESTERN CHEMICAL COMPANY
713-15 WASHINGTON ST., KANSAS CITY, MO.

KNO-DRAFT K-NEWS

AIR VOLUME AT YOUR FINGER TIPS

. . . without the sacrifice of any of the benefits of perfect air diffusion. This is made available through the new KNO-DRAFT* Air Diffuser equipped with Type DEE Air Volume Control.



Cutaway diagram of Kno-Draft Air Diffuser equipped with Type Dee Air Volume Control

Designed to complement the function of the diffuser, it permits varying the air *quantity* without affecting the *characteristics* of the air distribution.

Furnished completely assembled within the diffuser and adjusted—ready to operate.

**Formerly known as Dorex Kno-Draft Air Diffuser*

WB CONNOR ENGINEERING CORP

W. B. CONNOR ENGINEERING CORP.
114 East 32nd Street New York, N. Y.

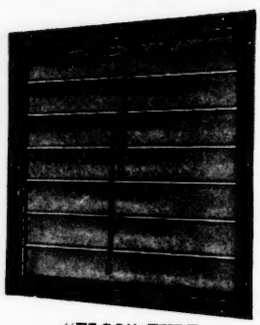
Elgo Ventilating Specialties

The Latest In Automatic Shutters!

An automatic shutter with a patented counter-balancing mechanism that makes the louvres open the instant the fan or blower starts, and snap tight-shut when the air current stops.

Adjustable for different air velocities according to the requirements of any particular installation.

Absolutely quiet. Its spring mechanism holds the louvres so firmly closed when not in use that there is never any flapping or fluttering.



"ELGO" TYPE AUTOMATIC SHUTTER
Rear View (Closed)

Completely weather-stripped around the inner edge of the frame, making the unit the tightest-fitting shutter on the market.

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Automatic Shutters — Ceiling Dampers
Balanced Vent Units — Motorized Shutters
Hand Operated Shutters

Free Catalog

ELGO SHUTTER & MFG. CO.
6968 W. JEFFERSON DETROIT, MICH.

the Month's NEW CATALOGS

WELDING DATA BOOK

Tube-Turns, Inc.
110 E. Broadway, Louisville, Ky.

Catalogue No. 111 contains 240 pages of up-to-date and essential engineering information for designers of welded piping systems and buyers of welding fittings, in addition to including numerous new technical studies and practical aids. The book is unusually well organized and indexed for convenient use. Pages lie flat, although not loose-leaf.

HUMIDIFICATION

Armstrong Machine Works
Three Rivers, Mich.

A new standard size two color, 8-page bulletin describes humidification as used in industry for the control of dust, lint, and static electricity, and for adding to human comfort. Textiles, woodworking, explosives, paper and rubber are some of the industries listed.

OIL HEATING

The Philip Carey Mfg. Co.
Lockland, Cincinnati Ohio

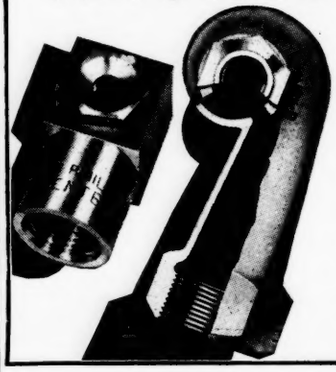
Reprints of the paper "How You Can Keep Warm on Rationed Fuel," by G. D. Lortz, Chairman Technical Committee of the National Mineral Wool Association, are available for distrbution by oil, lumber and insulation dealers and contractors. The paper outlines a simple method by which the average oil user can calculate the effect of various steps which he might take toward saving part of his season's fuel oil supply, such as improvement of burner efficiency, attic and side-wall insulation, and installation of storm sash.

CONTROLS

Allen-Bradley Company
1311 S. First St., Milwaukee, Wis.

Bulletin No. 836, 8 pages, describes the company's line of pressure and temperature controls for pilot duty application, for the operation of contactors, or for the direct control of small a-c and d-c motors. The controls listed are for pressures ranging from 30 in. vacuum to 500 lb per sq in. Temperatures range between —40F and 415F.

YARWAY INVOLUTE NOZZLES



The preference for trouble-free air washing service — because there are no internal parts or vanes to wear or clog. Proven through many years of service in water cooling and air conditioning installations totaling more than 5 million g. p. m.

Made in sizes and types for all requirements. Ask for Bulletin N-616.

YARNALL-WARING CO., PHILA.
104 MERMAID AVENUE

CONTROLS

Wheelco Instruments Company
Harrison and Peoria Streets, Chicago, Ill.

Volume No. 2 of Wheelco Comments discusses design features, operating principles and applications of pyrometers, potentiometers, and thermometers. Construction features which permit removal of operating parts for inspection, repair and replacement are illustrated.

ROOM COOLERS

Carrier Corp.
Syracuse, N. Y.

New specification sheets on two types of cold diffusers have just been issued. Sheet 15T-2 lists the specifications and dimensions for Type 15T brine spray cooling unit, which is especially adaptable for storage rooms near or below freezing, and where latent heat loads are heavy, such as in fresh meat and meat products storage. Sheet gives similar information for dry-surface Type 15Q coolers.

CONTROLS

Arrow-Hart & Hegeman Electric Co.
Hartford, Conn.

A new electrical controls data book, "A—H & H Electrical Controls," gives detailed specification data for the use of heating and ventilating engineers in laying out systems. Contains a simplified arrangement of recommended controls for each type of equipment.

INDUSTRIAL DEGREE DAYS NOVEMBER, 1942

City	Number of Industrial Degree Days	
	55F Base	45F Base
Baltimore	217	50
Buffalo	439	178
Chicago	432	187
Cleveland	347	121
Detroit	420	169
Indianapolis	314	100
New York	268	77
Philadelphia	235	63
Pittsburgh	316	97
St. Louis	251	74

COMING EVENTS

JANUARY 25-27.—49th annual meeting of the American Society of Heating and Ventilating Engineers, Hotel Gibson, Cincinnati, Ohio. Further information from A. V. Hutchinson, secretary, ASHVE, 51 Madison Ave., New York, N. Y.

H&V's PHOTOS

Page 29, Official Office of War Information photo, by Palmer.
Page 51, Acme photo.

FOR LOW-COST HEATING, QUICK INSTALLATION AND METAL CONSERVATION

DIRECTHERM UNIT HEATERS STOKER-FIRED

It is a self-contained unit and can be installed or moved in a few hours. No duct work, radiators, or pipes are necessary.

To tend a Directherm requires a minimum of attention. Once the automatic controls are set, they need not be changed. An unskilled man can take care of it . . . important in these days of labor shortage.

Made in 6 sizes (300,000-1,700,000 BTU).

AIRTHERM MANUFACTURING COMPANY

722 S. SPRING AVE., ST. LOUIS, MO.